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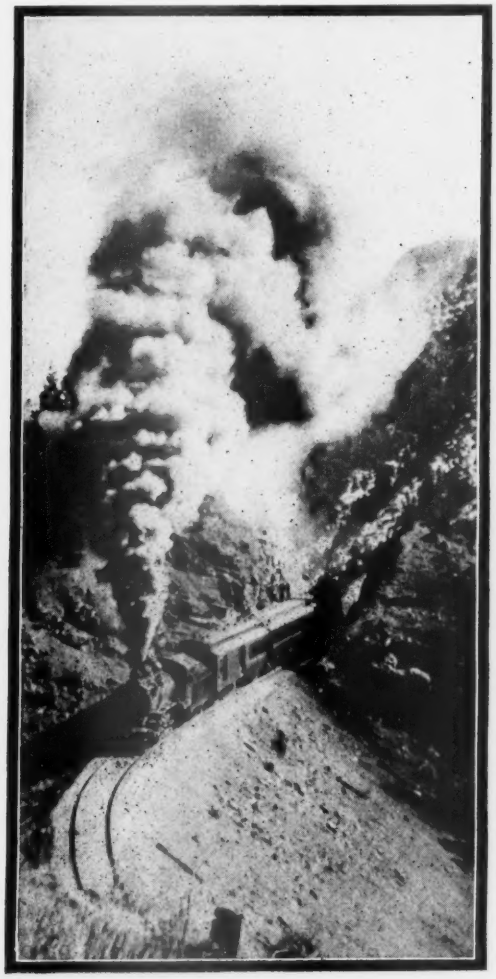

VISIT OUR NATIONAL PARKS!

On the way to Cripple Creek.

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Treating Fence Posts

WOOD PRESERVATION

A timely talk of interest to all users of structural wood

Open Tank Process

PUBLISHED BY US EVERY FEW WEEKS IN THE SATURDAY EVENING POST

EVERY form of business depends more or less upon lumber. No other material lends itself to so many uses. The beauty and comfort of our homes, the very existence of our railroads, the economical handling of manufactured goods, the benefits of a free press—the entire prosperity of the nation, in fact, is built up on a plentiful supply of this most necessary material.

Our Vanishing Forests

Within a century, our forests have been reduced from 850,000,000 acres to 150,000,000. We are consuming lumber at a greater rate than ever before. Replanting is a matter of years, while our vital need is to protect our present supply. *Con*servation and *pre*servation must join hands—*you* must do your share by preserving from decay every stick of lumber that you use.

Carbosota is a wood preservative that every lumber buyer, large or small, can employ with profit. Its application is simple, and it has the effect of greatly prolonging the life of wood at a cost far below that of replacing it after it has decayed.

Decayed flooring, side and intermediate sills of freight car.

On the Railroad

The

Reprinted from Lumber World Review, March 25, 1920 Issue

"A Valuable Opinion on 'Forest Devastation' from Henry S. Graves, Former Forester

'We recently received a letter from Henry Solon Graves, now ex-forester of the United States Forest Service, Department of Agriculture, Washington, D. C., which we consider altogether the most substantial statement Mr. Graves has ever made on the subject of forest devastation. Here it is:

'We must take our choice between stopping forest devastation and lessening prosperity. Do we want to sink to the condition of the European countries, where scarcity and high cost of wood handicap industry and human comfort? We must decide now.....

'Timber must not become an imported luxury in the United States. We must apply the American spirit of development in stimulating production—but at the right point. We must neither lock up our forest resources nor butcher them, but make the most of them. Not restrictions on the use of timber but efficient use of land to grow timber and efficient use of the timber itself is the true way out. The first step is to call a halt on the present devastation of timber-growing land. We are letting use and ruin go hand in hand.

'I am urging that all the interests concerned join in a drive, not to stop the use of timber but to stop waste...

'The conservation of timber by extending its life in use is true forest conservation. We must do everything that science and ingenuity can devise to increase the usefulness and prolong the life of wood. I am heartily in accord with every sound effort that is being made to extend the longevity of timber in various industrial uses.....The conservation of [illegible] through better methods of using it [illegible] the whole scheme of forest co[illegible]

The Farmer and County Agent

The rise in lumber prices has hit the farmer as well as every other user. If he buys lumber it costs nearly double what it did. If he cuts his lumber from the wood-lot, the increased value of his own or hired labor has boosted the cost until it is just as essential for him to prolong the life of his own lumber as for any other user of wood.

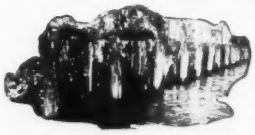
Usually the county agricul[illegible] agent will gladly show the farmer to save money by wood preser[illegible]

For Poles and Cross[illegible]

Our annual bill for [illegible] telephone, tel[illegible]

[illegible] ing poles [illegible]nt

the lumber. For larger work, where suitable equipment is obtainable, the Open Tank process, which consists in the immersion of the lumber in hot and cold baths of Carbosota is naturally more effective, although more costly



Decayed piling and sheathing on fresh water lake.

Summer Resorts

Summer property, at the thousands of interior lak[illegible] resorts as well as seashore pl[illegible] considerable [illegible]ly, because [illegible]es

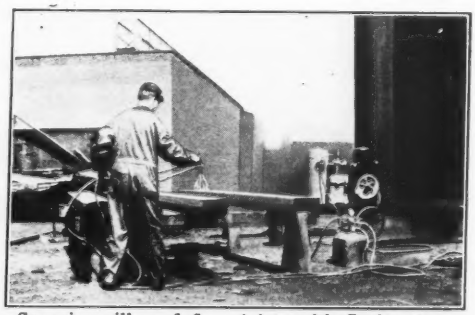
A Lumber Famine

How would a lumber famine affect your business?

This is an imminent danger—unless all building and manufacturing interests combine to conserve lumber.

The immediate remedy is to specify preservative treatment of all structural timber with Carbosota Creosote Oil.

Read this timely talk in May 29th Saturday Evening Post or write our experts to advise you as to the most practical treatment. Their services may be obtained without charge by addressing the nearest office.



Spraying sills and floor joists with Carbosota

What is Carbosota?

Carbosota Creosote Oil is a highly refined and specially processed Coal-tar Creosote, particularly adapted to Surface treatments (brush treatment or painting, spraying and dipping), and the Open Tank process. It conforms to standard specifications.

Barrett B Carbosota Grade-One Liquid Creosote Oil

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AMERICAN FORESTRY

VOL. XXVI JUNE 1920 NO. 318

EDITORIAL

STATE FORESTS IN MASSACHUSETTS

AMERICAN FORESTRY has frequently emphasized the necessity for a constructive plan to keep the large forest areas of New England productive. One of the most far-sighted and promising steps in this direction is the proposal now brought before the Legislature of Massachusetts by an initiative petition bearing the signature of 31,000 citizens of the State for the purchase and reforestation of 250,000 acres of her idle forest lands. Massachusetts, which has been forced to import steadily increasing quantities of timber from the Gulf Coast and the Pacific Northwest, has within a stone's throw of her teeming factories a million acres of burned and cut off timber land now producing but a small fraction of the wood which it might grow. Much of this land was once part of the wonderful white pine forests which greeted the Pilgrims.

The plan proposed strikes directly at the problem presented by this enormous acreage of idle land in the heart of one of the most highly developed manufacturing sections of the country. The State will not only buy a quarter of the land, but will immediately restock it so that within ten years the areas purchased will be growing timber at their full productive capacity. The scheme is particularly significant in this respect. While other States have acquired or retained cut off timber land, the planting of denuded areas is proceeding slowly. Massachusetts proposes not only to enter the first rank of forest owners but immediately to make her State properties highly productive forests.

The broad financial basis of the scheme will also commend itself to all those who believe in an aggressive attack upon our national forest problem. Current revenues to the State are not mortgaged and tax burdens will not be increased. The enterprise, including even the current protection of the new forests, will be carried by serial bonds until sufficient revenues are obtained to liquidate capital charges and make the project self-supporting. In other words, the State will become the owner of an exceedingly valuable forest property simply by the loan of its credit.

The calculations of yield and ultimate returns upon which this proposal is based appear sound. Regardless of detailed figures, it is doubtful if anyone can question the fundamental soundness from a purely financial standpoint of a long-term investment of this character in a region where unused forest land is so cheap, where tree growth is so rapid, and timber values are so high. Nevertheless, no one should lose sight of the fact that the greatest return to Massachusetts will not appear on the ledger of its timber purchasing account. The production at home of a large quantity of timber needed by the industries of the State, the effect of a large local production upon lumber prices in a competitive market partly supplied from outside sources, the stimulus given to the reforestation of similar land by private owners, the public benefits of large areas of State forest at the doors of densely populated towns for health and recreation—these in the long run will be the greatest returns.

The Massachusetts Forestry Association is to be warmly commended for the far-sighted initiative which has now made it possible to bring this plan in concrete form before the people of the State. Every advocate of forestry should support it. There are few things which Massachusetts could do which would contribute more to the security of her industries in the future or to the general welfare of her people. And in the adoption of this measure, Massachusetts will set an admirable example to many other States, confronted with the same problem of idle forest land and excessive prices on imported lumber, in the constructive solution of a difficult problem.

GENERAL WOOD FOR A FOREST POLICY

IT is well to know, in advance of election, the views of any candidate for office, and the question of State and National forest policies. An appreciation of the value of forests; an acknowledgment of their vital importance; and a desire to aid in measures to perpetuate them is what is expected of every good citizen. It is, therefore, not surprising that Major General Leonard Wood, long a member of the American Forestry Association, a close friend and confidant of Colonel Roosevelt, who was an ardent advocate of forestry, should in a letter to President Charles Lathrop Pack, of the Association, voice his sentiments in the following pertinent paragraphs:

"I am heartily in favor of a National and State legislative program which will provide for the perpetuation of our forests so that there will be a sufficient supply of forest products for our future needs, as well as ample forests for the protection of watersheds and for the recreational needs of the people.

"The steady decrease in our forested land, the losses by forest fires and disease, the growing acreage of cut-over lands unforested but serviceable only for forests, all emphasize the need of a forest policy which will provide for proper protection of our forests, for reforestation, and for investigation to determine the best means of perpetuating them.

"Our citizens have in the last two years been brought to a realization of what a vital factor in the prosperity of the country our forests are; they know how greatly our forest holdings have been decreased and they appreciate the danger of the disappearance of our forests. It is time, therefore, for prompt action, so that our forests may be so managed and protected, that they yield timber as a periodical crop, and that our waste lands be restored to forests wherever possible."

MORE FEDERAL FOREST LAND URGED

FURTHER purchases by the Government of forest lands in the Southern Appalachian and White Mountains to relieve the present shortage of timber in those regions are advocated by the National Forest Reservation Commission in a report just issued, entitled "Progress of Purchase of Eastern National Forests." This commission is the body authorized to pass on timberland purchases made under the Week's law, and is composed of the Secretaries of Agriculture, Interior, and War, and four Members of Congress.

"The supply of spruce in the eastern United States available for paper stock is nearly exhausted," the publication states. "Eastern building material is no longer adequate fully to meet industrial demands, the future supply of hardwoods is threatened and will not be sufficient unless prompt measures are taken for maintaining the productivity of the hardwood forests."

The situation can be helped materially, says the report, by arranging that lands not suitable for agriculture—of which there are 30,000,000 acres in the eastern mountains—shall be used for growing timber. Of this 30,000,000 acres approximately 1,800,000 acres have been purchased by the Government under the provisions of the Week's law, which authorizes the acquisition of lands on the headwaters of navigable streams for inclusion within national forests.

Appropriations totaling $11,600,000 have already been made under the Week's law, and the expenditure of all but about $300,000 of the amount available for purchasing lands has been authorized by the commission. Twenty-one purchase areas, with a total area of approximately 7,000,000 acres, have been designated in nine States in the important hardwood and spruce regions of the Appalachian and White Mountains. In 17 of these, purchases have been made. Since the purchase program was developed other States, including Kentucky, have enacted legislation authorizing the acquisition of lands for national forest purposes. To carry out the purchase program as outlined by the commission an appropriation of $2,000,000 per year for a period of five years, beginning with the fiscal year 1921, has been recommended by the commission.

The average price of the 1,841,934 acres whose acquisition has been authorized by the commission is $5.26 per acre. The Government is getting good value for its money, the report states. While some of the lands purchased have been cut over and burned, but at present support a stand of young timber from which no immediate returns can be expected, others have a large amount of merchantable timber. All of the lands bought are capable of producing valuable crops of timber. During the fiscal year 1919 receipts for timber sold from the area then acquired—1,347,660 acres—amounted to $71,942 under the conservative method of cutting practiced by the Government. The timber that was sold was very largely salvage, and it is expected that the returns from timber sales will steadily increase.

In addition to the financial return, the establishment of national forests results in a decided benefit to navigable streams through the modifying influence of the forest cover on erosion, according to the report. It states that the newly created forests are being widely used for recreation by residents of the near-by cities and that they are meeting other important economic needs. Watersheds which supply domestic water to seventeen municipalities are owned in whole or in part by the Government. In addition, twenty-nine municipalities secure their water supply from lands which have not yet been acquired but which are located within the forests. Government control assures the sanitation of such watersheds without interfering with the use of the land for timber-producing purposes.

PAN-PACIFIC SCIENTIFIC CONGRESS

A PAN-PACIFIC Scientific Congress is to meet at at Honolulu from August 2 to 20, 1920. Its purpose, in the words of its chairman, Herbert E. Gregory, of the Bernice Pauahi Bishop Museum at Honolulu, "is to outline scientific problems of the Pacific Ocean region and to suggest methods for their solution; to make a critical inventory of existing knowledge, and to devise plans for future studies. It is anticipated that this congress will formulate for publication a program of research which will serve as a guide for co-ôperative work for individuals, institutions and governmental agencies.

It is to be hoped that forestry will receive its fair share of attention in the proceedings of the congress. The United States has a very real interest in knowing more than at present of the forest resources of the Pacific Islands and shore lands. This is true not only because of our forest holdings in California, Oregon, Washington, Alaska, Hawaii, and the Philippines, but because with the growing depletion of our own timber supplies, the resources of other countries will become of

steadily increasing importance to us. Moreover, even should we adopt a comprehensive forest policy which will assure us a sufficient timber supply to meet our own needs and leave a comfortable surplus for export, we shall undoubtedly wish to develop timber trade relations with other countries in and bordering the Pacific. Douglas fir from the Northwest, for example, should find a ready market in Australia and other countries poor in softwoods, while in return we may wish to import hardwoods from them. The world is constantly growing smaller, and as trade becomes more and more international in character there will be an increasing interchange between countries of forest products as well as of other commodities.

All of this means that there must be far more knowledge than is now available as to the forest resources of the world. The Pan-Pacific Scientific Congress offers an excellent opportunity to formulate a concrete program for securing scientific information of this sort. Such a program should include investigations of the extent and character of the forests; of the identification, properties, and value of the trees composing them; of their utilization and management; and of the many economic problems involved in the development and maintenance of an international trade in forest products. The undertaking is one of enormous magnitude and calls for the best brains and the most cordial co-operation of all those interested to carry it to completion.

In all probability, the congress will be attended by forestry representatives from Hawaii and the Philippines. American Forestry wishes to urge the importance of having similar representation from the United States proper. Surely the forest problems of the Pacific are of sufficient interest to this country to justify the Federal Forest Service in sending one or more representatives. Delegates might also be sent to advantage from the forest schools, at least two of which now offer instruction in tropical forestry. The first of August is only two months away. It is none too early for the Forest Service and other interested organizations and individuals to begin to formulate plans for active participation in the congress.

FORESTRY IN AUSTRALIA

THAT Australia is much better off regarding future supplies of lumber than is the United States, is the assertion of V. B. Trapp, of Melbourne, president of the Victorian Forest League. In a letter to the editor of AMERICAN FORESTRY, Mr. Trapp says:

"There is no doubt the world is threatened with a timber famine, and the only way to bring this home to the public is through forestry associations. We here are certainly better off than you, although we have not nearly sufficient forests for the future generations. Taking it all through in Australia, 90% of the forest lands are still held by the Government. There is not 10% privately owned. You can well judge how important this is and also how fortunate Australia is not to have alienated its forests. By proper supervision, 30 to 40 years should see Australia in one of the best positions as regards timbers. Again, fortunately for us, our hardwoods, which are beginning to be appreciated, regenerate themselves. Our shortage is in softwoods and we have ample land for the proper growing of the pines."

If 90% of the forests of the United States were owned by the Government and the States, and there were ample appropriations for reforesting cutover lands and protecting the forests, this country would also in a moderately short time be able to assure future generations of sufficient supplies of home grown timber for our future needs.

SWEDEN SETS US A GOOD EXAMPLE

THE impression made upon an American student of Forestry by the practice of forestry in Sweden is interesting reading, now that the need of a forest policy in this country is receiving so much attention. W. Stuart Moir, of Yale Forest School, who holds an American-Scandinavian Fellowship and is studying forestry in Sweden writes:

"The longer I stay in a country where technical forestry management is practiced, the more strongly the appreciation of what it means to the welfare of the country is impressed upon me. May we in America stir ourselves and make an honest attempt to solve the question of developing a rational forest policy before we suffer staggering losses through our continual practice of exploitation and waste.

"The American Forestry Association is the medium through which the work of education can be carried out which will lead to construction legislation along these lines. It is great to see the way you are taking hold of the task."

AS IF TIMBER WAS INEXHAUSTIBLE

IF all our citizens had the same clear sighted point of view regarding the forest situation as has the editor of the Chattanooga, Tennessee, *News,* no further propaganda for a national forest policy would be necessary —we could proceed to secure the necessary legislation at once. He says, in commenting editorially on items sent him by the American Forestry Association to show the need of a national forest policy: "We use and waste timber as if the supply were inexhaustible. When some one rises up to tell us the danger of the speed at which we are traveling, we listen languidly for a brief while, then proceed with the dance." He goes on to say further "Americans found a continent well timbered. They have used forest products with a lavish hand. There has apparently been an impression that we couldn't get along with less. We shall have to learn the lesson however for the end of our supply is in sight."

THE USE OF AIRCRAFT IN FORESTRY

BY ELLWOOD WILSON

OFTEN, in years gone by, when trying to make maps of the immense tracts of forest land in Canada with the thermometer at 50 below zero or the black flies and mosquitoes eating one alive, the writer wished for a balloon. The labor required to get supplies into the woods, the hardships to be overcome, the toil required to map a few square miles of rough, heavily timbered country and the amounts expended seemed so out of proportion to the results obtained. One party of ten men used to do 50 square miles a month at a cost of about fifteen to sixteen dollars per square mile, and we mapped 2,800 square miles. Then the timber estimates had to be made, which involved tramping through the woods, calipering and estimating the trees and trying to find accurately the dividing lines between types.

FOREST PHOTOGRAPHED FROM THE AIR

1—Woods Depot. 2—Lake. 3—Dam. 4—Booms. 5—Log Road. 6—Logs left on shore of lake. 7—White and Yellow Birch, few conifers. 8—Stand of Conifers. 9—Shadow of hill.

Now the dream has come true and in Canada with its myriad lakes, the flying boat, equipped with the Eastman K-1 aerial camera, just a glorified motor-driven "kodak," is doing in hours what it took months to do on the ground.

Thanks to the generosity and broad-mindedness of the Minister of Naval Affairs, Mr. C. C. Ballantyne, who loaned two HS2L flying boats, and the Hon. Jules Allard, ex-Minister of Lands and Forests of Quebec, and the St. Maurice Forest Protective Association, who together subscribed $12,000 for the work, the writer was enabled to try experiments in spotting forest fires and making photographic maps of the forest.

The two seaplanes were assembled at the Station at Halifax and flown across Nova Scotia, New Brunswick and Northern Maine to Lac a la Tortue, Quebec, by Lieutenant Stuart Graham, of the British Navy. These two trips of 750 miles each were made without any mishap whatever. Unfortunately by this time the worst of the forest fire season was over so that there were only two opportunities to see forest fires. It was found that they could be seen at a distance of twenty to thirty miles and that by flying to them one could see just the state of affairs. In one case we saw the men who had lighted a fire. The moral value of the planes in fire prevention is something to be considered, for if people find that they can be seen from a flying machine setting fires they will be less apt to be careless in the woods. Then, too, never knowing just when a plane may appear, or from what direction, incendiaries will most certainly become less numerous.

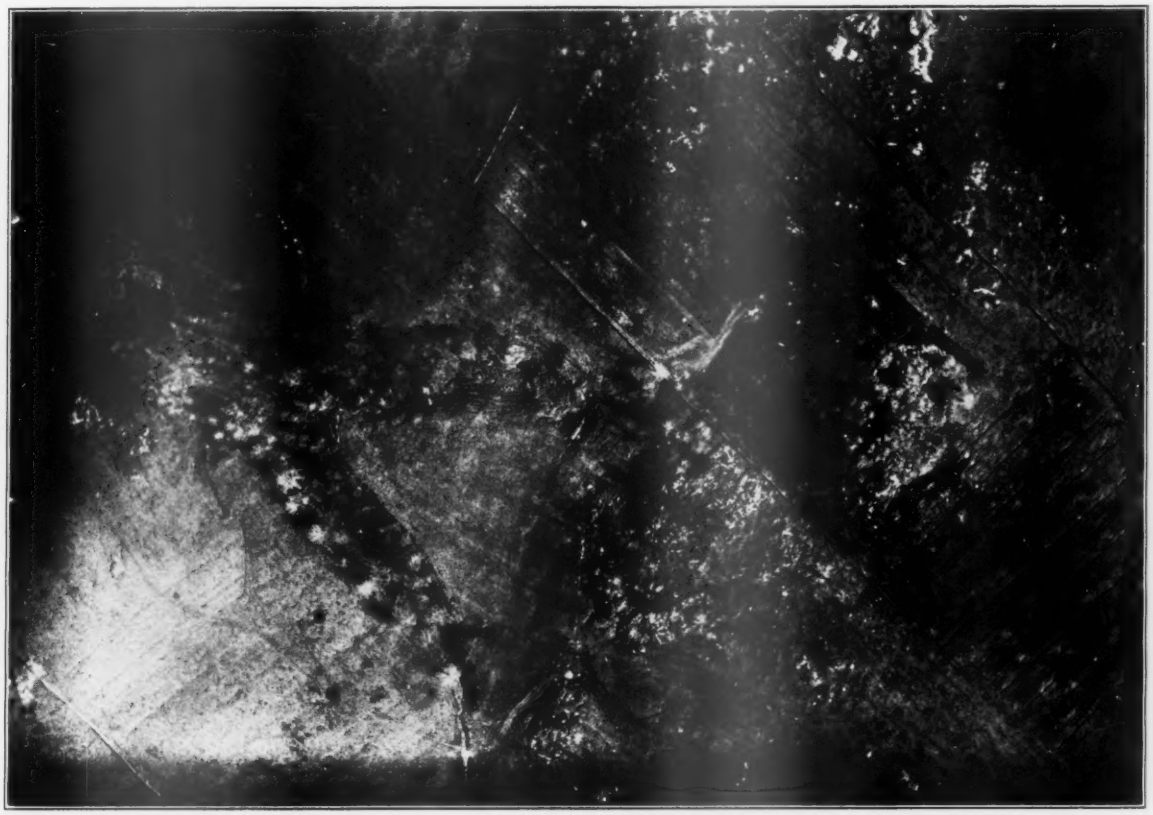
PART OF ST. MAURICE RIVER, QUEBEC

1—Logs in boom and loose in river. 2—Skating rink. 3—Lumber piled in yard. 4—Saw mill, Belgo Canadian Company. 5—Bridge. 6—Concrete Road. 7—Railroad.

A small gasoline pump, which can easily be carried by two men, with 1,500 feet of 1½-inch hose was constantly in readiness at the station to take to a fire if needed.

It was wonderful, in flying over a wooded country, to see how easily the boundaries of the various timber types could be traced and by taking a map into the air, the various types, the approximate size and density of the timber could be esaily sketched on it, and that, too, much more accurately than from a ground reconnoissance. One afternoon, flying over a tract of fifty square miles which had been carefully mapped a few years before, I found a small lake which had not been located by the field party, and although I had often been over the tract on foot, I brought back more information in the hour I was over the tract than I had previously gathered. In flying over a tract which we contemplated purchasing, we were able bi-weekly aerial photographs of the log drives so that it can see at once what progress has been made and whether the rivers have been swept clean. By noting the points where the logs jam and stick it will be possible to make plans for the removal of obstructions, the building of piers and other river improvements.

Photographs are taken at the speed of about sixty miles an hour, which means about one hundred pictures in that time covering forty-five square miles—about as much country mapped in one hour as a crew of men will do in a month and with much more detail and accuracy and giving at the same time, directly from the picture, the areas of lakes, of burns, of swamps and of the different types of



PHOTOGRAPH OF FOREST AND FARM LAND TAKEN FROM AN AIRPLANE

The skilled observer is enabled by such a photograph as this to map in one hour as much country as a crew of men can do in a month and at one-tenth the cost and with much more detail and accuracy, giving at the same time the areas of lakes, swamps, of burned land, and the different types of timber.

in one afternoon to see that it did not contain enough timber to warrant paying the price asked.

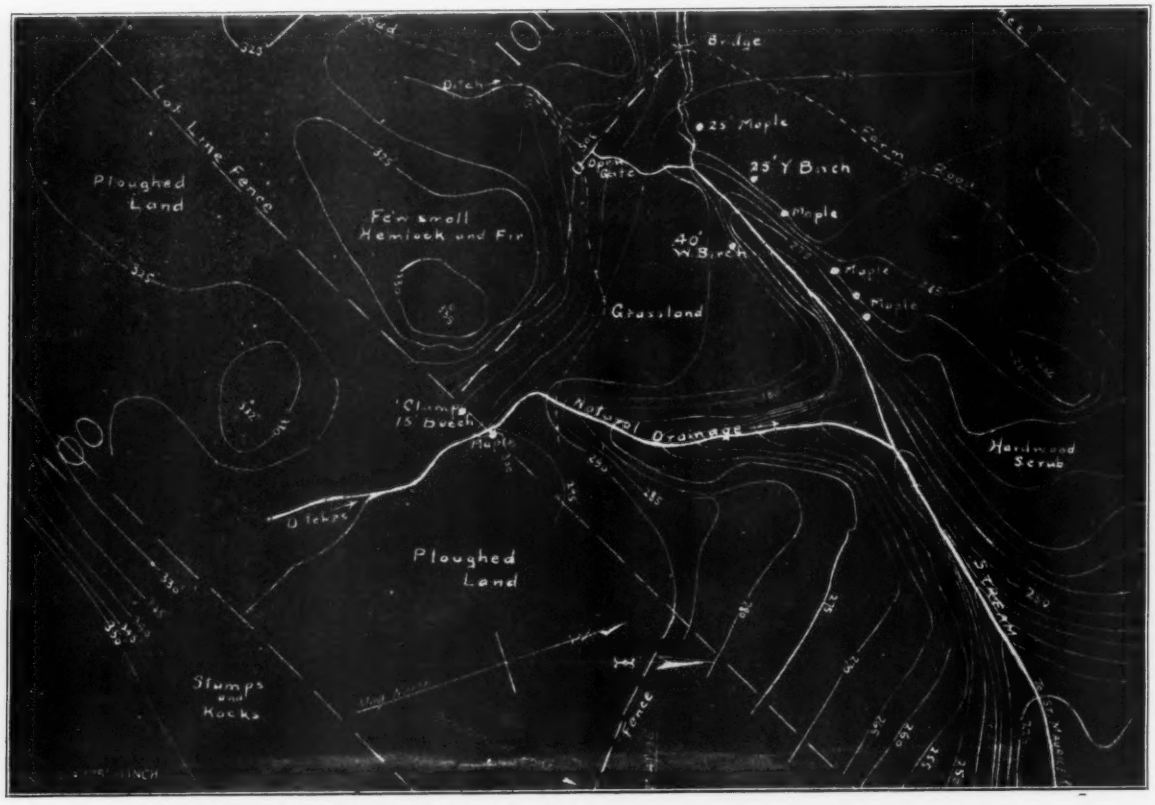
The different species of trees shown up with remarkable clearness from the air and the topography, camps, roads and trails can be seen, and the shallows in the lakes and rivers can be picked out. Logs left in the rivers and lakes by the drives of the previous year can be readily seen and photographed and if the number in a unit area on a photograph are counted and the area measured with a planimeter, a much closer estimate of the number in any body of water can be obtained than by having a man look at them from the shore and guess.

It is the intention, during the coming season, to take timber. The cost of the aerial work too, is only about one-tenth of that of the ground work. The photographs are eight by ten inches and the best altitude for this work is about five thousand feet, which gives a scale of 400 feet to the inch.

We have a party in the woods now studying the interpretation of the forest photographs and have already found that we can draw the boundaries of the timber types with great accuracy, and that in many cases we can draw contours. Individual trees in the photographs can be easily located and species can be distinguished. We are now studying areas which seem to be typical on the photographs, calipering every tree which enters the crown

cover and getting the number of trees of each species and their heights. When this work is finished we shall have a reliable legend for reading the photographs. We have another party studying photographs taken over brush and farm lands which it is proposed to buy for reforestation and find this photographic work of the greatest value. Building, lot lines, cleared land, swamp, brush, roads, fences(stump land and drainage ditches all show up with remarkable clearness, and photographs are most useful in buying the land as they give more information than the owner has himself.

The illustration shows a photograph which was taken at a low altitude of a piece of land which had actually had a contour map made of it (see page —), and the contrast is very interesting.



A CONTOUR MAP OF THE AREA COVERED BY THE PHOTOGRAPH ON THE PRECEDING PAGE

For making maps and estimates of the enormous areas in eastern Canada which have not yet been surveyed, aerial work will prove of the greatest value and will make it possible to secure in a very few years information about the timber lands so sorely needed and which cannot be had in any other way except at a prohibitive cost and after many years of labor. It is proposed during the coming season to cover from three to four thousand square miles of territory and if other companies which are contemplating similar work carry out their programs a very large area will be covered by the end of the summer. Aerial work will also prove of value in studying the problems of water storage for power and irrigation projects and for the location of new railway lines and cut-offs for existing lines. The planes will also be of value in logging operations, enabling the superintendent to make more frequent trips to his operations and to keep in closer touch with his men. Then in case of accidents in the woods, the injured can be brought out without delay.

Little has been said about the value of the planes in fire-protection as we had little opportunity to demonstrate it, but from the work done in the west and my own experience in sighting a fire from the air and investigating its origin, I feel sure that the planes will soon do away with ground patrols almost entirely.

Aerial work is bound to be of great use in many ways in the near future but I venture to say that in no department will it prove of more value than in forestry, especially in giving what is so sorely needed—a sufficiently accurate inventory of forest resources in a reasonable length of time and at a reasonable cost. It will do away with much of the drudgery and monotony of forest reconnoissance.

HOW FIRES DESTROY OUR FORESTS

BY J. V. HOFMANN, U. S. FOREST SERVICE

THE destruction of a forest may be accomplished in one spectacular conflagration. Such an event will be universally regarded as a lamentable calamity. Public sentiment will be greatly aroused and sympathy will be vividly expressed. The loss in forest wealth, in personal property, and often in human life inspires a grim determination in those directly affected to prevent the recurrence of such a catastrophe. But, all too soon, the public feeling grows calm again, the distressing event is forgotten, and another stage is set at once for a repetition of the tragedy. This, moreover, has been the history of all the great forest fires that have taken place in the United States of recent years. However, these stern events are not so quickly forgotten in the forest itself; in the very trees are found the records of all the fires that have occurred for generations past.

WHERE NATURE IS GIVEN A CHANCE

A stand of mature yellow pine with a splendid understory of yellow pine which makes a complete stand when the large timber is removed. Second growth comes in under the mature forest when fires are kept out. Crater National Forest, Southern Oregon.

While these great historic fires have attracted the attention of the public, there are other types of forest fire which, although they excite little interest or fear, are slowly but surely causing the destruction of the forests. The most common among these is the surface fire, which is often the result of "light burning." It is sometimes carelessly set or even maliciously started for personal reasons. However they originate, the final effect of repeated fires is the same: a forest can not perpetuate itself when the young growth is annually or even less often destroyed by fire.

The successive stages in the destruction of a forest by fire are recorded in the appearance of the forest. Certain outstanding features, perfectly evident even to the untrained observer, characterize these successive stages in progressive destruction. The first stage is marked by the occurrence of the native forest in patches, on the same slopes, in the valleys, or in the moist situations. The second stage is indicated by the presence of remnants of the preceding forest either in standing snags or down charred logs in the midst of the even-aged growing and seeding stock. The third stage is characterized by the young trees, not yet seeding, but in even-aged, well-stocked stands, with here and there the standing snags of the preceding forest. In the fourth stage there is young growth, with the seedlings either standing alone or in small groups. The fifth stage shows seed trees, but with the trees of seeding age scattered or in groups. In the sixth stage the area is covered with brush or grass. The seventh stage is that of the barren area or the eroded slope. This is the general order of transformation when successive fires convert a productive forest into a barren waste. The manner and the time of the occurrence of each of these changes are clearly

A FOREST WITHOUT A FUTURE

No reproduction under mature stand of yellow pine. Young growth has been destroyed by surface fires. Note fire scar on tree marked X. Exposed dry slopes will seldom reforest naturally after the timber has been removed, and artificial restocking is difficult and expensive. Crater National Forest, Southern Oregon.

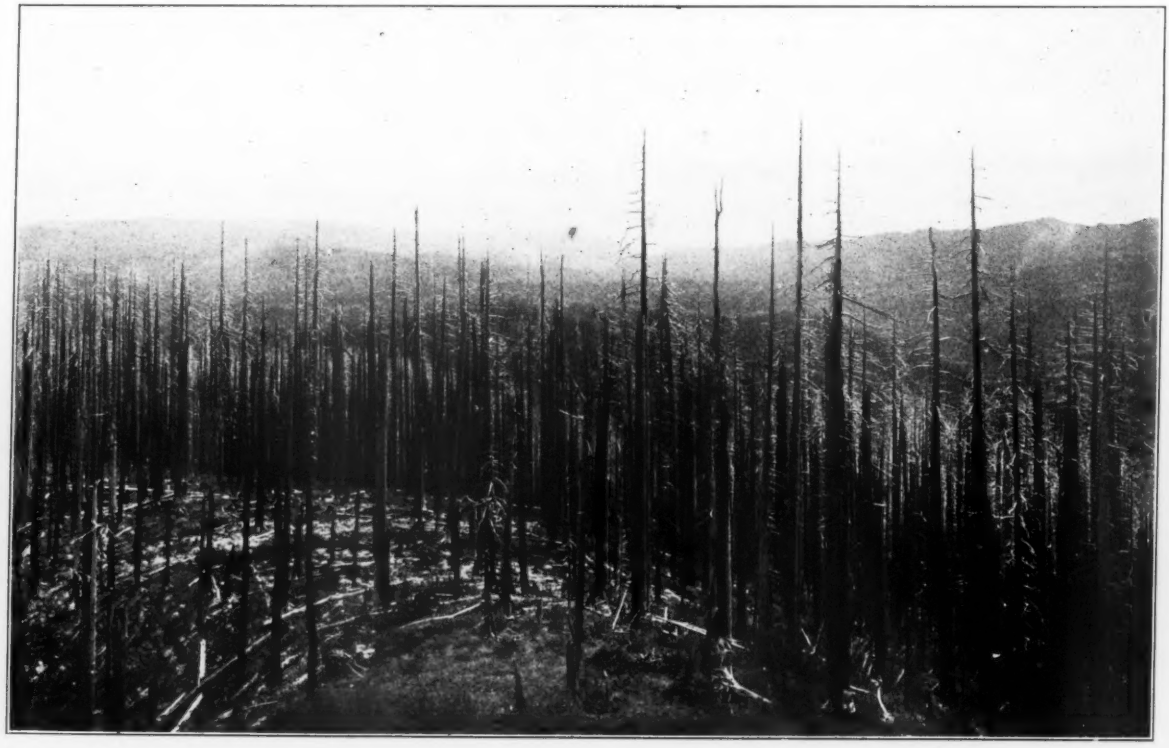
recorded in the forest itself. The records are carved by the passing fires on the scarred veterans that remain. On areas where the process is not yet complete, the marks of the various stages are clearly distinguished. When fire injures a growing tree but does not kill it, the wound grows over. The burned spot, however, remains as a dead area, and the annual rings are formed around it. By counting the new growth rings, the date of the fire that caused the wound may be determined. Most large trees show clearly the effects of the many fires they have survived during a period, perhaps, of more than three centuries.

COUNTING GROWTH RINGS TO DETERMINE DATE OF FIRE

Twenty-three rings since the fire scar was inflicted shows that the fire occurred 23 years ago. Rainier National Forest, South Central Washington.

The occurrence, destruction, and after-effects of fire in the forests of the Pacific Northwest have been studied by the investigators of the Wind River Experiment Station during the past seven years. The data obtained lead to the incontrovertible conclusion that any fire is a dangerous enemy to the forest, and that the amount of destruction it may cause depends upon the type of fire into which it chances to develop. The discussion in this article of the various stages of forest destruction is a summarized explanation of how and why forest growth is eliminated by repeated fires just as surely as though that destruction were accomplished by a single fire.

The complete destruction of a forest by a single fire is the most conspicuous type; hence it has been regarded as the first step in the process of deforestation. The destruction of a mature forest by a single fire would reduce much of the forested area to brush fields or barren wastes were it not for the adequate provisions of nature for restocking such areas in large part. A mature forest usually produces some seed annually and heavy crops periodically. A large part of the seed produced is eaten by rodents, but these same forest inhabitants store away seed in the duff and soil of the forest floor for their future use. Some of these stores are not needed or are not found in the deep duff after the winter is over, and so they remain in the cool, shaded forest



Photograph by Wernsted.

HOW A SINGLE FIRE CAN DESTROY A MATURE FOREST

Note the bare ridge on the left-hand side of the view (south slope) where the fire was hottest. The right-hand side shows young growth coming in on the north slope. View on "Yacolt burn" of 1902, in South Central Washington, where more than half a million acres of forest were destroyed.

floor for long periods, sometimes for eight years or more. When the forest is destroyed by fire the seeds stored in the forest floor are usually not all destroyed. The sunlight and warmth which reach the soil after the forest is removed soon cause the seeds that lived through the fire to spring to life, and the forest is replaced as if by magic. This accounts for the young stands found in some of the large burns where no green trees were left for seed trees. A notable example is the well-known "Yacolt burn" in southern Washington, which occurred in 1902. Although a forest of more than half a million acres was completely killed, this area is now clothed with a magnificent stand of young growth, which sprang up immediately after the fire from seed that was stored in the forest floor. The entire forest is destroyed only when an exceptional combination of conditions exists. Long dry periods preceding a fire and a strong wind accompanying a fire will produce conditions favorable for developing a crown fire. When crown fires are carried before a wind in mountainous country the slopes facing the direction from which the fire comes will usually be completely burned, but patches of green timber may be left on the opposite slopes, or in the valleys, or in moist situations.

TRYING TO COME BACK

One and two year old knob-cone pine seedlings are growing under a small seed tree that was killed by a fire two years before the picture was taken. Such groups of reproduction disappear with the next fire. Crater National Forest, Southern Oregon.

Only occasional mature trees are killed by surface fires, but the fire gets into the bases of a number of the trees through cracks in the bark and through pitch pockets, and fire scars result through which diseases enter and cause rots and loss of timber.

These surface fires also destroy seed and cones and prevent an accumulation of litter, which is the storage

THE SOUTHERN SLOPE IS THE FIRST TO BECOME A BRUSH FIELD

On account of dry conditions the southern slopes suffer more severe fires and, also, are more frequently burned. The usual condition in this stage of fire destruction is shown by timbered northern slopes and brushy southern slopes. Crater National Forest, Southern Oregon.

TRAIL THROUGH A SPLENDID STAND OF YOUNG GROWTH

Natural young stand of Douglas fir that followed a 1902 fire where a mature forest had been destroyed. Rainier National Forest, South Central Washington.

bed for seed and moisture. Young growth that may have started in openings among the trees is destroyed wholly or in part by surface fires. The recurrence of such fires in the mature forest eventually destroys it, and, with the young growth destroyed, there is no provision for replacement.

The chances for young growth following a large fire are best in a mature forest, and the next best conditions are found in a growing forest that is producing seed. This has been characterized as the second stage of forest destruction. A forest 25 to 100 years old is producing seed long before it is mature for cutting, but during its younger stages the forest floor differs from that of the mature forest in that the duff is shallow and the conditions for seed storage are not so favorable. A fire that destroys a forest of this type usually is hot enough at the surface of the ground to kill most of the stored seed. The result is a scattered stand of young growth in place of the dense stands that follow fires in mature forests. Surface fires cause a great deal of damage to forests during the younger stages because the bark of the trees is still thin and the cambium layer inside of the bark is easily killed. Fire scars result, which cause serious defects in the butt logs as the trees grow larger. A severe fire may cause the complete destruction of the forest during this period and even light fires cause permanent damage to the present stand as well as the destruction of young growth.

RESULT OF A SECOND FIRE IN YOUNG GROWTH

A 1902 fire, which killed a mature forest, was followed by a good stand of reproduction, as shown on the left. In 1910 a second fire killed parts of the stand of young growth, and a barren area resulted, as shown on the right. Oregon National Forest, Northern Oregon.

The third stage is taken as that most critical period through which the coniferous forest passes in perpetuating itself. This covers the time from the beginning of a stand to the time it reacher seeding age. If it is destroyed during this period, there is no provision left for its renewal. There has been no seed produced, and the seed that lived through the previous fire has all germinated. The well-stocked stand of young growth on the "Yacolt burn" is in this stage at present, and it must be safeguarded from fire. There are many such

THE LAST CHANCE DESTROYED

The killed Douglas fir saplings were the future seed trees on this area. There were on an average 160 trees to the acre. All forest growth disappeared from this area because fire killed these trees before they had reached seeding age. Crater National Forest, Southern Oregon.

DENSE REPRODUCTION

Douglas fir, noble fir, Western white pine, and hemlock 40 years old, following a single fire that destroyed a mature stand.

areas in the Pacific Northwest forest region now.

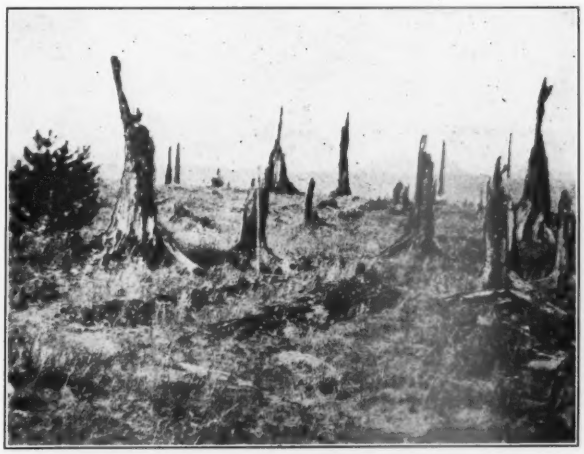
The next or fourth step in forest depletion comes when a fire runs through a stand of young growth and leaves patches unburned. A sparse stand of young seedlings in brush or in open burns is too often considered of little or no value. Such seedlings should be regarded as the future seed trees of those areas and should be protected in order that the areas may be restocked again. This process of reforestation, however slow, will eventually restock an area if fires are kept out. Surface fires kill such seedlings and leave the area as a brush tangle without any chance for natural reforestation.

There is another stage in which single seed trees or groups of trees were left by the fire that killed the forest, but in which all reproduction has been destroyed by subsequent fires. This may be considered as the fifth stage, and it is the last one in which the forest has any chance of natural reseeding. During the process of destruction in a forest single trees or groups of trees sometimes escape. These remain as outposts around which a forest may again develop. Seeding by wind-blown seed occurs for short distances only from the parent tree. Surface fires will usually not kill these single veteran trees; but repeated burning prevents seedlings from getting established around them, and each fire claims some of the seed trees. Wherever one of these trees is removed by fire or windthrow another section is added to the brush area. By the occurrence of periodic fires the entire area soon becomes a nonproducing, though still a potential, forest area. Many such brush fields occur now in Southern Oregon and in the Cascade Mountains of Oregon and Washington.

VARIOUS STAGES OF FOREST DESTRUCTION BY FIRE

Scattered stand of a young growth that followed the destruction of a young forest which had reached seeding age. Rainier National Forest, near Mt. Adams, South Central Washington.

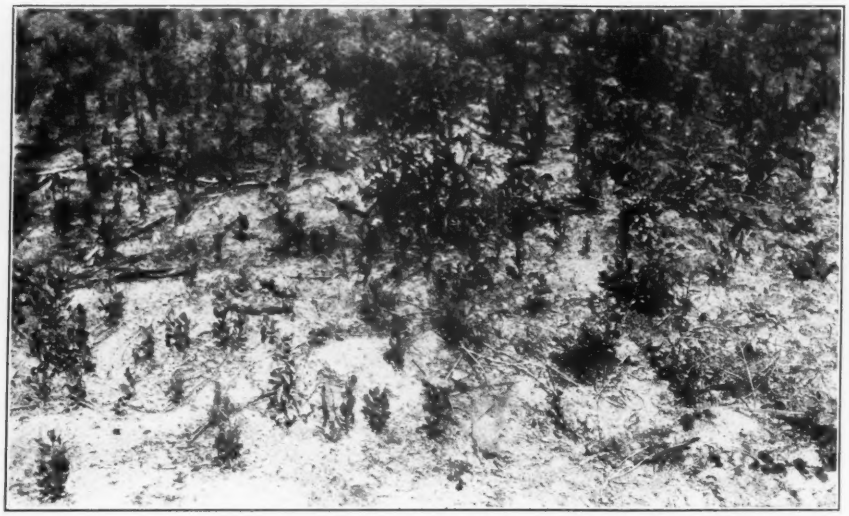
The sixth successive stage from the mature forest is the result of the consistent recurrence of fires which inevitably reduce the forest to a brush area. The presence of this almost impenetrable mass of brush has led to the attempt to clear the area by fire. Usually the reasons for the presence of the brush or the ultimate result of clearing the area by burning are not considered. The very evident fact that the land is clear of brush after a severe fire is considered sufficient basis for using fire as the clearing agent. That the fire may only intensify the stand of brush and postpone the time when the land will be reclaimed by the forest is not given any weight in the justification of its use. Examinations of brush areas after several fires show that some of the



THE FOREST GIVES WAY TO FIRE

Area burned over repeatedly. Only an occasional seedling of the most fire-resistant species, lodgepole pine or white bark pine, left.

persistent species reappear immediately after the fire in denser formations than before. Manzanita has been found to produce as high as 95 new shoots from a single burned stump. Other species of manzanita and chamise are prolific seeders, and the seed lives through the fire. Stands of 90 seedlings to the square yard have been noted where but one bush to the square rod grew before the fire. Ceanothus, rhododendron, and vine maple, as well as most shrub species, survive these periodic fires and form these formidable thickets.



HOW BRUSH FOLLOWS FIRE

A stand of 91 seedlings to the square yard of manzanita has grown up where only one bush to the square rod stood before the fire. Crater National Forest, Southern Oregon.

While the brush areas represent the last stage of the forest, they must also be considered as advance agents of forest establishment. On severely exposed slopes and in such regions as southern Oregon the forest-tree seedlings require some protection to become established. Striking examples are shown in the establishment of yellow pine seedlings in the Crater National Forest in southern Oregon where 95 per cent of the young seedlings were found established under bushes of chamise and manzanita. A brush cover not only insures better moisture conditions but also offers shade to the young seedlings. An area which had not been burned for 20 years had a moisture content of 6.2 per cent in the surface soil and 4.25 per cent at a depth of 6 inches when it was examined during the most severe dry period in August. This is sufficient moisture for the establishment and growth of tree seedlings. An area burned one year previous to the examination had only .87 per cent of moisture in the surface soil and 3 per cent at a depth of 6 inches. These data show that seedlings could not become established on this area because the moisture in the surface soil is less than the seedlings require. In this way the brush gradually prepares the way for the return of the forest. To accomplish this, however, fires must be kept out.

The final or seventh stage is reached when all growth except annuals and some grasses has been distroyed by repeated fires. The barren appearance of the slopes and ridges has inspired the too common name of "Bald Mountain" in this region. These mountains are monuments to the menace of repeated fires, whether these fires are started by intent or through carelessness. Where the fires have recurred in such close succession as to destroy shrubbery as well as forest growth serious erosion has resulted. These eroded slopes are not only non-productive but detrimental to the conservation and purity of the water supply. The muddy waters are a serious menace to irrigation projects because of the silt deposits that are made in the reservoirs and ditches. By the exclusion of fire the conditions favorable to tree growth are gradually re-established through the reclamation of the area by brush. This is a necessary step in the succession of plant life in this region—a fact that has been demonstrated by the establishment of tree seedlings under brush and their failure to establish themselves in the open. Fire

THE LAST LINE OF DEFENSE

Erosion is held in check by the brush, but gullies have begun to form. Crater National Forest, Southern Oregon.

protection on cut-over areas is even more important than on the forest. The cut-over areas are, up to the present time, in the most productive timber regions, and timber growth is more rapid on these areas than on the mountain slopes. A great deal of the young growth that follows logging operations in the Douglas fir region has come from seed that was stored in the forest floor before the timber was cut. On areas where the slash and debris left after logging were burned at a time when the forest floor was moist enough to save some of the stored seed, good stands of young growth sprang up. The large areas of logged-off land that are barren have been made so by repeated fires. As shown previously, when the young stands burn there is no seed left to restock the area, and the method of clear cutting removes all seed trees. In order to restock these cut-over lands the slash should be burned the same season in which the logging is done and at a time when the forest floor is moist enough to prevent the soil from getting too hot. In this way reproduction usually follows the fire. The areas must not be allowed to burn over a second time.

The important facts about the destruction of a forest by fire and the reasons for protecting the forest throughout its various stages of development may well be recounted.

When the mature forest has been destroyed, a stand of young growth usually follows if the area is not again burned over. This young growth comes from seed which was stored in the forest floor and which lived through the fire. Should this young stand be destroyed before it reaches seeding age, there would be no further forest growth because of the absence of seed on the area to produce a new stand.

Surface fires kill only occasional mature trees, but they cause much damage to standing

THREE SUCCESSIVE STAGES OF FOREST DESTRUCTION

GOING! GOING! GONE!

Top—Ridges and southern slopes are burned clear of forest growth. Middle—Only scattered trees are left after several fires. Bottom—Hills and slopes are reduced to barren wastes by repeated fires. Note the few trees that are left in the background. All of this is potential forest land on the Crater National Forest in Southern Oregon, which would produce good timber of yellow pine and Douglas fir; but it would have to be replanted, as it will not restore itself.

timber through fire scars. They also kill any young growth in the openings of the forest or on cut-over or burned areas.

In the general practice of logging in the Douglas fir region, all trees are cut. This method leaves the area without seed trees, and when young growth is destroyed there is no provision for its replacement. A large part of the young growth on cut-over areas has come from seed that was stored in the forest floor. Such reproduction can occur only on areas where all fires have been kept out after logging or where only one slash fire occurred soon after logging and at a time when the forest floor was moist enough to protect some of the seed stored in the duff or soil.

Repeated burning ultimately produces barren areas. Such areas are not only non-productive; they are a positive menace to communities in mountain valleys. Muddy water and floods are caused, and even the water supply itself is endangered.

NATIONAL HONOR ROLL, MEMORIAL TREES

Trees have been planted for the following and registered with the American Forestry Association, which desires to register each Memorial Tree planted in the United States. A certificate of registration will be sent to each person, corporation, club or community reporting the planting of a Memorial Tree to the Association.

SAYBROOK, CONN.

By Old Saybrook Town Improvement Association: Harry G. Faulk.

WASHINGTON, D. C.

By Children of American Revolution; National Society Children of American Revolution. By Human Education Society: 3 trees planted for "Remember the Animals and Birds that Fell."

TAMPA, FLA.

By Tampa Rotary Club: James Adams, Donald Ansley, Norman Badger, Reuben Baker, Fred. C. Banta, Earl Clark Bell, Lieut. George Berriman, Algy K. Bivens, Arthur A. Bivens, John D. Barker, Leonard Bozeman, W. R. Bozeman, Jack L. Brantley, Leo Brazil, John F. Bryan, Ramon Cabrera, H. A. Carmichael, Henry B. P. Clayton, Percy F. Cox, Coke P. Coleman, Walter R. Connell, Sgt. Chas. B. Copp, R. E. Cordova, Eric Culbreath, Elder Davis, Olin D. Youngblood, J. G. Darnou, Cecil Emerson, Preston Fields, Del Finley, Maurice Fonseca, Britton Francis, Chas. E. Galvin, John M. Garcia, Robert L. Bradley, Douglas Gammon, David D. Gee, Tod F. Gillett, Marcello Gonzales, Donald Griffin, Vincenzo Guerriero, Chester Hanks, J. W. Hatton, Lieut. Thos. H. Hill, Will Holland, Percy Hurn, Edmund Jochumsen, Freddie Johns, Andrew Jones, Arthur St. Clair Jones, Jack Jones, J. G. W. Kirkland, Willie Kitts, Louis Leeks, E. D. Legree, Armando Leon, Lytle Louden, Joseph A. Lowe, Fred Mansfield, Percy Mansfield, Norman E. McLeod, Angus McLean, Allen L. McMenomy, Chas. W. Middleton, Sam Middleton, Lorenzo Moody, John G. Nelson, Robt. L. Norwood, J. D. Nix, Millard L. Owens, A. J .Pederson, Charles D. Peoples, Clarence Perkins, Marion L. Perritt, Louis Pumorega, J. F. Quisenberry, R. G. Robertson, Emmett L. Simmons, Clarence Slater, Homer Sumner, Wamboldt Sumner, Cyrus S. Taylor, William S. Taylor, Stanley Tillis, Louis Torres, Rufus M. Tounsley, Fred. E. Turner, Louis Vaughan, Harold D. Walker, Stephen B. Ward, Luther Wells, Patrick White, Leo F. Wiggins, Charles S. Wilson, Napoleon B. Wilson, Herbert C. Wooton, Cora Davis.

INDIANAPOLIS, IND.

By Indianapolis Orphan's Asylum: Theodore Roosevelt, William Warner, Curtis Simmons.

WASHINGTON, IND.

By Washington Rotary Club: Jefferson V. Vincent.

FORT MADISON, IOWA

By Ida Mansfield Circle, The King's Daughters: Theodore Roosevelt, Rev. Harry Deiman, Hartman Dawson, Lester Harter, Vincent Hunt, Bernard Pollpeter, Theodore Kokjohn, Harry Vincent, Miles Ramborger, Lawrence Duckworth, Alois Pollpeter, Dorothy Koellner. By Hope Circle, Presbyterian Church: Rev. Harry Deiman, Hartman Dawson, Lester Harter.

GRAFTON, MASS.

By Old Oak Chapter, D. A. R.: Earle B. Stowell, George J. Geleneau, Albert M. Usher, Louis J. Hitchings, Franklin S. Clark.

GROTON, MASS.

By Groton Woman's Club: Sgt. Laurence W. Gay, Seaman Charles P. McHean, Carl B. Gleason, Lieut. John W. Bradley, Clarence Curtis, William C. B. Gilson.

BUHL, MINN.

By Board of Education: Howard Bennett, James Doherty, Cornelius B. Goodspeed, Fred. M. Goodspeed, Arthur C. Williams.

HARRISON, N. J.

By Employees Service Committee, Edison Lamp Works: Colonel Theodore Roosevelt, Leo Sharwell.

VALOIS, N. Y.

By Valois School: William Earle Sutphen, William Coon, Ray C. Gunderman.

BALFOUR, N. DAK.

By Progressive Civic League: Emil Sigfrid Olson, Olaf Edward Myhre, Ulrik Garlie, Jonas August Johnson, Gustav Adolph Stenerson, Louis C. Knuth.

LANCASTER, PA.

By Donegal Society: Lieut. Alexander Rodgers, Jr., Lieut. Daniel Schenck Keller, Lieut. Benjamin Hiestand.

COLUMBIA, TENN.

By Business Women's Association: Henry Hill, Harry Thompson, Isiah Abernathy, Corp. Jim Granberry, James Satterfield, Harry P. Davis, Ed. Walker, Will Houston, Isaac Tom Watkins, James Ewing, Richard Wainright, Jesse J. Thompson, Jim Abernathy.

COLLEGE STATION, TEXAS

By Agricultural and Mechanical College: Elmer Curtis Allison, Farris Shelton Anderson, Clifton Barfield, Walter Gustavos Bevill, William Fowler Bourland, Thomas Reed Brailsford, Vories P. Brown, Jr., Richard Platt Bull, Jr., Joseph Daniel Carter, Romeo Willis Cox, Samuel Reid Craig, Norman C. Crocker, Edward Bishop Crook, M. F. Curtis, Jesse L. Easterwood, J. G. Ellis, Jr., James Ronald Findlater, Benjamin H. Gardner, Jr., Eric Albert Goldbeck, Edwin Mobley Gorman, Cyrus Earle Graham, James Francis Greer, George Little Harrison, Hamlet Park Jones, Charles Hausser, Walter Sherman Keeling, Luke Witt Loftus, Graham Danuel Luhn, Willford McFadden, John Clyde McKimmey, John Lamar Matthews, Hadyn Potter Myers, John Hartwell Moore, John Bolanz Murphy, Robert Walker Noble, Herbert N. Peters, Harry Lamar Peyton, Wendall Francis Prime, Ferdinand Regenbrecht, Edmund Laritz Riesner, Charles Edward Rust, Frank William Slaton, Charles Leroy Teague, William George Thomas, John Percy Thompson, George Francis Wellage, Coney Uncas Woodman, Richard P. Wooley, Benjamin Fiske Wright, Horace Conrad Yates, John Herbert Burford, L. S. R. Suber, James Munroe Woodson.

BOLIVAR, W. VA.

By Caleb Bible Class, M. E. Sunday School: 3 trees planted "To Our Patriots."

WHEN MEMORIAL TREES ARE PLANTED PLEASE INFORM THE AMERICAN FORESTRY ASSOCIATION, WASHINGTON, D. C.

FORESTS AS A FARM CROP

BY E. T. MEREDITH, SECRETARY OF AGRICULTURE

(Written for American Forestry Magazine)

A LARGER portion of the farm area of the United States is devoted to wood than to any other crop. The total area of woodland on farms, according to the 1910 census, was double the acreage of corn, nearly three times that of hay and forage, four times of wheat ,and six times that of cotton. There was as much farm land in woods as in all cereal crops combined.

In New Hampshire and Vermont, the forest products of farms were second only to hay and forage in total value; in Maine they stood third, exceeded only by hay and forage and potatoes, while in Alabama, Arkansas, Georgia, Mississippi, and South Carolina they also held third place, following corn and cotton. The value of timber products from farm woodlands for the entire United States was more than $195,000,000.

Yet, in spite of the enormous area of farm woods and the value of their product, this branch of farming has, in practically the whole country, received less attention than any other. Few farmers nowadays would expect to make a profit from their wheat, corn, hay or cotton fields, or from their orchards, without giving them a great deal of care and attention. They certainly do not attempt to raise these crops merely by harvesting what chances to grow wild, with no preparation of the soil, no fertilizer, no selection of varieties, no cultivation or weeding, no protection against fires, grazing animals, or destructive insects and fungous diseases.

Farm production of timber should be much greater than it now is, not only because of the benefit to the farmers, who by better use of their wood-growing land might increase their income, but also because of the benefit to the public generally, which, with good reason, is becoming deeply concerned over the question of waning timber supplies.

But this is the way most farm woodlands have been treated. The total value of woodland products, $195,000,000, seems large, to be sure, but when it is remembered that this comes from more than 190,000,000 acres of land, the average production per acre is very small. Pasture is, of course, not being taken into consideration here. It is safe to say that, with very little additional outlay, the woodlands now on farms could produce an annual net income from timber products alone several times greater than the present amount.

Farm production of timber should be much greater than it now is, not only because of the benefit to the farmers, who by better use of their wood-growing land might increase their income, but also because of the benefit to the public generally, which, with good reason, is becoming deeply concerned over the question of waning timber supplies. The Department of Agriculture has an obligation to the country in the whole matter of forestry. Our public forests can not begin to supply our needs. Private forest lands, other than the farm woodlands, are being cut over destructively. Those owned by farmers are as a rule neglected. We can no more do without wood than we could do without iron or coal. It is a necessity of our national life; and it must be grown. The Department of Agriculture would be neglecting an important field of duty were it not to concern itself with the replacement of timber growth on lands naturally best adapted to producing timber, and with the most efficient handling of the lands devoted to this important crop.

The department, through one of its bureaus, the Forest Service, has for years been studying the problems which scientific timber production involve, and can therefore give much helpful advice to farmers as to progressive methods. The Department has also inaugurated a nation-wide movement looking to the general practice of forestry by private owners, so that the forest devastation, which now almost universally attends or follows large-scale lumbering, may be halted.

Most farm woodlands are used to a greater or less extent for pasturing stock. Many woodlots start as open pastures, in which the trees gradually seed in and shade out the forage crop. Others start as dense forests, where the stock and frequent fires, by gradually reducing the density and preventing tree reproduction, eventually destroy the forest or reduce it to open, park-like stands of defective timber which has little commercial value. Too little attention is generally given to maintain the proper balance between grazing use and the production of timber.

If the main object is to raise forage crops, it would be more profitable, as a general rule, to remove most if not all of the tree growth. On the other hand, if the land is chiefly valuable for growing trees, it should not be pastured in such a way as to make impossible the profitable production of timber. One of the most serious abuses to which our farm woodlands are subject is excessive over-grazing, or grazing with the wrong kind of stock, or the annual burning which is often practiced on the theory that it improves grazing. A certain amount of regulated pasturage is in most regions not incompatible with timber production, and indeed may be the means of utilizing a very important by-product of the woodlands, and so add very materially to the revenue derived from them. In some cases properly regulated grazing may even be used as a silvicultural measure to improve the wood crops. Once the individual farmer realizes

the value of the wood crop, if it is rightly handled, understands the conditions which must be maintained to grow good timber, and grasps the nature of the damage which overgrazing does, he can readily work out for himself how to make his woodland best answer his needs.

From the standpoint of timber alone, most farm woodlands as at present handled serve principally for one or both of two main purposes. They afford shelter to crops, buildings, and stock, and they furnish a ready supply of firewood, fence posts, and other low-grade material for farm uses or for sale in nearby communities. Of the $195,000,000 forest crop of 1909, the farms themselves used $103,000,000 worth, and only $92,000,000 worth was sold.

In striking contrast to this figure, the total value of all forest products for the United States was more than a billion dollars, of which approximately three-fourths came from the woodlands owned by lumbermen. Few people realize that farmers own as large an area of forest land as do all the lumbermen and other private owners combined. Yet such is the case. Moreover, the farm forests, in most instances, have a decided advantage over the holdings of other owners, in that they are usually easy of access and are close to a market for the low-grade material that is wasted in most lumbering operations. In fact, this low-grade material, really almost a by-product of the main business of growing timber, is, in a very large proportion of cases, about all that the farm forests now produce.

There is no good reason why our farm forests should produce only firewood and similar low-grade material. They can, and should, produce a very large share of the Nation's railroad ties, telephone and telegraph poles, cooperage material, tanbark and acidwood, veneer logs and even lumber.

This condition is due entirely to neglect and lack of knowledge of woodlot care. With any treatment, or lack of treatment, which stops short of the most ruinous abuse, the farm forest will provide shelter, and also a certain amount of firewood, fencing, and similar material. But it will not be a profitable part of the farm. There is no more reason to feel satisfied with a woodlot which merely fills these needs than there is to be satisfied with wheat which yields only five bushels to the acre, or with orchards which produce only cider apples, and less than half a crop at that.

It is not yet generally understood that forest crops also may be greatly improved, both in volume and quantity, if care is used in handling the woodlots. That this is true has been amply demonstrated not only in other countries, where returns from woodlands are often a very important part of the farm revenues, but also in every part of the United States where a fair trial has been made. On many of the farms in the white pine belt of central New England, saw-timber furnishes the best-paying crop produced. There is no good reason why our farm forest should produce only firewood and similar low-grade material. They can, and should, produce a very large share of the nation's railroad ties, telephone and telegraph poles, cooperage material, tanbark and acidwood, veneer logs, and even of lumber.

When trees are cut from time to time merely to supply farm needs as they arise, with no definite plan or forethought for future needs, the woodlands, of course become run down. If when the farmer wants a few fence posts or his winter's firewood, he selects the trees which will work up most easily or are most convenient to get out, the chances are that he will remove the very trees which ought to be left until they develop into high-grade material. Then later, when perhaps he wants to raise some ready money, instead of a valuable stand of readily salable timber he may find on his woodland a poor growth of trees fit only for firewood. Relatively few farm woodlands are fully stocked, and fewer still are stocked with the kinds of trees that will produce the greatest return. Using these lands to grow poor crops of inferior wood is very much like using good pasture land to support scrub cattle. Certainly, no good farmer would market steadily the best animals from a herd of cows and breed from the poorest.

Recent developments are bringing out much more clearly than ever before the opportunities to make farm woodlands yield a good return. The increasing scarcity of many important and high-priced woods, such as black walnut, black locust, red cedar, ash, hickory, and white oak, is resulting in an intensive combing over of the small holdings in many parts of the country. In some sections, the search for timber for box boards or for pulp is almost as intensive. The extension of good roads and the development of the motor-truck have made it possible, in many instances, for buyers to scour a region and even to pick up single trees, where formerly they could not consider any lots less than a carload. Farmers who have been farsighted enough to maintain their woods in first-class condition are now in a position to begin to reap the benefits, if they have not already done so. Those who have overlooked the possibilities of timber as a money-producing crop should take immediate steps to develop this important source of farm revenue.

More than half of the entire hardwood forest area in the country is on farms, and, with the cutting out and gradual clearing of the larger hardwood tracts, they must, more and more, come to be the main source of supply for many of our most valuable woods. Among these are the oaks, walnut, yellow poplar, hickory, ash, maple, elm, and beech, which are indispensible for many of our most important wood-using industries, such as the manufacture of furniture, vehicles, and farm tools and machinery. Farmers own about one-third of all the

(*Continued on page 342*)

MANAGEMENT OF THE STATE FORESTS OF PENNSYLVANIA

BY JOSEPH S. ILLICK

CHIEF, DIVISION OF SILVICULTURE PENNSYLVANIA DEPARTMENT OF FORESTRY

THE practice of forestry began at an early date in Pennsylvania. In 1681 William Penn, in his Charter of Rights, prescribed a method of perpetuating the forest resources of the State. Ever since this early attempt a few private owners of forest land have managed their properties with care and forethought, but the real advent of rational forest management did not take place until after the State began to acquire forest land. In 1897 the Legislature authorized the State purchase of forest land for the purpose of establishing

STARTING FOR A FOREST FIRE ON THE MONT ALTO STATE FOREST WITH A STATE-OWNED TRUCK

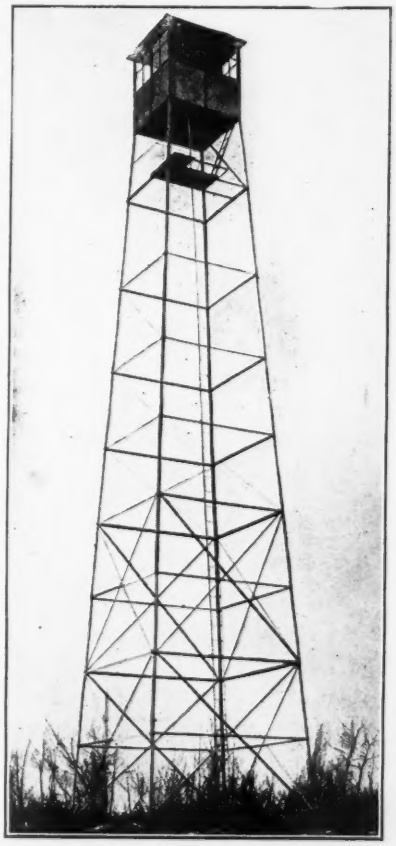
Forest Reserves, now known as State Forests. Since then each Legislature has appropriated money for the acquisition of additional forest land and for the development of that already in possession of the State. To date (January 1, 1920) 1,048,692 acres have been purchased at a total cost of $2,391,943.51, which represents an average price of $2.28 per acre.

The purpose of acquiring forest land for the State was not to *preserve* or *reserve* the products found thereon, but to develop and improve the land to its maximum productive capacity by using methods which are economically recommendable and give sylvicultural satisfaction. Such an objective implies an orderly plan of management, but before such a plan can become operative a number of preparatory procedures must be successfully carried out. Among them are two which may be regarded as prerequisites to the orderly management of any forest property, viz.: (1) The establishment of clear title to all pending acquisitions, and (2) the definite location and accurate delimitations of all purchased areas.

The ownership of a tract of forest land cannot be assumed, but must be established by a thorough examination of all titles. A real business-like acquisition procedure will prevent many a subsequent dispute, or possibly costly litigations. In this field of endeavor the Pennsylvania Department of Forestry has been singularly successful, for in only two instances has title to tracts of State forest land been questioned, and in both cases the court decided in favor of the State. The experience of Pennsylvania foresters in the field of forest land acquisition shows conclusively that a clear title must be established in all instances before acquisition proceedings are completed and before the plans of management are applied.

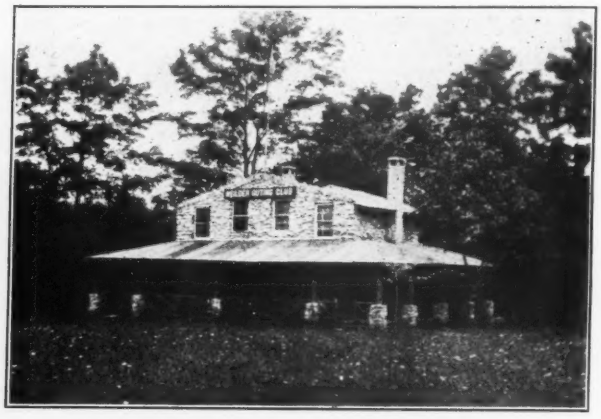
The second prerequisite implies that a careful and complete boundary survey should be made immediately after the forest land is acquired. This will enable the forester in charge of the land to make a complete and systematic study of the forest growth conditions present upon the area, and on the basis of this study he will be able to prescribe a method of handling it properly. Such a survey and clearing of boundary lines will also prevent adjoining land owners from trespassing intentionally or encroaching innocently upon the state-owned land.

The two foregoing preparatory procedures are very important, but they are of little consequence unless followed up by the three essentials to the orderly handling of a forest property, viz.: *men*, *money* and *material*. Ever since the purchase of State forest land began in Pennsylvania it was evident to those in charge of the business that every acre of acquired land is in need of recuperative treatment.



ONE OF NINE STEEL FOREST FIRE TOWERS ON THE STATE FORESTS OF PENNSYLVANIA

The condition of the growth on most of the land was extremely unsatisfactory and implied that much constructive work was to be done. In this undertaking, just as in all others, work implies workmen. The nature and newness of the required forestal operations suggested that the men assigned to do the work should be prepared for their responsible positions by a course of training in forestry. For five years after Pennsylvania began purchasing forest land no full course of forestry was offered by any institution within the State, and only three insti-



PRIVATELY OWNED RECREATION CAMP ON THE CLEARFIELD STATE FOREST OF PENNSYLVANIA

Hundreds of camp sites within the State Forests have been leased to clubs and other organizations.

tutions were offering complete courses within the country. This acute situation had to be met, and was met by the Department establishing its own school of forestry at Mont Alto in 1903. The establishment of the school could not be deferred, for trained foresters were urgently needed. Over 100 men have been graduated from this school and were awarded the degree of Bachelor of Forestry. The establishment of the Pennsylvania State Forest Academy was an educational experiment which not only has met the progressive demands of Pennsylvania forestry during the past 17 years but also greatly surpassed the highest hopes of its founder.

The operative methods, now in use on the 53 State forests, with an average area of 20,000 acres each, cannot be considered without mentioning the men from Mont Alto, for they conceived and introduced most of them. A few methods were *adopted* from the practice of foreign countries and some were *adapted* from foreign and neighboring State practice, but the best and most practical methods were worked out anew and are the result of local experiences and scientific experimentation on the State forests of Pennsylvania.

Money may be appropriated and materials may be available for the conduct of the business of a forest property, but these are insignificant essentials in comparison with the men, who are to expend the money and use the material. In order to develop the best operative methods in forestry the foresters must be satisfied. Satisfaction implies plenty of work, comfortable accommodations, and adequate remuneration. There appears to be no lack of work on the State forests, and comfortable accommodations are being supplied to the foresters as rapidly as possible. Many of them live in State-owned houses, equipped with modern conveniences and often supplemented with a garden and barn or garage, and a few of them are supplied with State-owned automobiles. It cannot be said, however, that their salaries are adequate, for the maximum now being paid to a forester in charge of a forest is $1,800.00 per year, and most of them receive only $1,500.00. In consequence of low salaries many of the foresters are seeking more lucrative positions, and in many instances their financial gain is great, but in almost all cases the loss to the State is even greater.

The main lines of work conducted by the foresters during the past decade comprise the disseminating of forestry information to the public, the protection of forests from fire, the planting of forest trees, the building of permanent forest roads, the utilization of forest products and the investigation of forest problems. The foresters have been engaged in many other minor lines of activities, but the foregoing embrace most of the major developmental operations.

Forestry cannot maintain itself or progress without the aid of favorable public sentiment. It is needed in all phases of the work. Many technical appliances have been designed by the Pennsylvania foresters to fight forest fires, and most of them have been extremely helpful in controlling the worst foe of the forest, but the best method of combating this ubiquitous curse of the forest is the development of a public sentiment which not only tolerates the protection of all forest land but urges its extension and promotion. Public sentiment in Pennsylvania favors the protection of the forest in the best form

REMOVING FUELWOOD FROM A STATE FOREST

The removal of dead and damaged material improves the composition of stands, and makes the forest more attractive and sanitary. The local fuelwood haulers pay 25 cents per load for the wood as they find it in the forest. On the Mont Alto State Forest approximately $500 is realized annually from the sale of this kind of material.

and to the fullest extent. However, it cannot operate alone, but must be supplemented with material and supplied with adequate funds. The material equipment now present upon the State forests, consisting of 9 steel observation towers and more than 125 wooden and tree towers, many miles of usable roads, lanes and trails, an extensive network of telephone lines and much other essential material, does not comprise all that is desired, nor is the present available appropriation of $50,000 per year for the handling of forest fires in all parts of the State adequate, yet the effect of a favorable public sentiment supporting forestry and the co-operation of the

A STATE FOREST ROAD AND TELEPHONE LINE

Both were constructed and are being maintained by the Pennsylvania Department of Forestry.

THE HOME OF A PENNSYLVANIA FOREST RANGER

The home is owned by the State and located on a high plateau within a State Forest and near an excellent observation point.

public in the prevention and extinction of forest fires is reflected in the following table, which shows the improvement in the forest fire situation on State-owned land during the past seven years:

Year.	Area of State Forest Land Burned (Acres).	Percentage of Total Area Burned.
1913	80,154.00	8.06%
1914	19,412.25	1.94
1915	36,689.00	3.65
1916	23,318.75	2.30
1917	14,441.90	1.42
1918	16,600.16	1.61
1919	13,298.25	1.27

If forest fires are kept out of the forests, nature will in most places reclothe the soil with a woody growth. Nature's methods, however, are slow and uncertain and the resulting stands are often unsatisfactory in condition and inferior in composition. Consequently, it soon became evident everywhere in the handling of the State forests that nature's results require supplementing by planting valuable young forest trees.

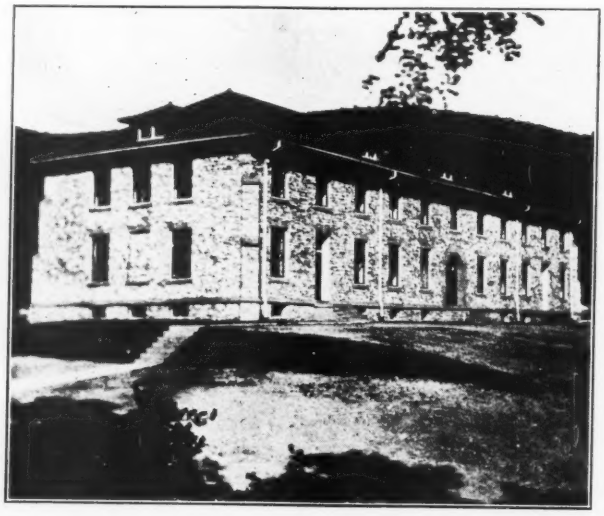
Planting has been in progress on the State Forests since 1899, and to date (January 1, 1920) over 33,000,000 trees have been set out. While most of the planting was experimental and comprised exotic as well as native species, yet about 75 per cent of the trees set out are still living, and most of these are making satisfactory growth. The planting of so large a number of trees required an expenditure of $204,425.93, which amount may seem large, but a careful study of the total expenditures of the Department of Forestry will show that only 3½ per cent was used in reforestation work. Such an expenditure is surely permissible, for in the normally stocked and intensively managed forests of Bavaria an allotment of 9 to 10 per cent of the total expenditure is made for reforestation. Inadequately and improperly stocked stands must be built up and improved. Protection alone will not do this work satisfactorily. A balanced development of a forest business is needed, which implies adequate protection, some planting, much natural regeneration and considerable improve-

A PENNSYLVANIA FORESTER'S HOME AND HEADQUARTERS

The house is owned by the State and located within the State Forest, in charge of the forester.

ments, which include roads, telephone lines and trails. The plantations on the State Forests of Pennsylvania have won more recruits to the cause of forestry than any other single line of forestal endeavor. They are the property of the State, with the citizens voluntarily serving as custodians. For 20 years trees have been planted on the State forests, and yet in spite of the large acreage reforestated only six-tenths of one per cent of the total planted area was burnt-over — that is, three-one-hundredths of one per cent annually. This creditable accomplishment indicates that the protection afforded them was good, and that planting on the State forests is reasonably safe.

More than 1,500 miles of old roads have been improved, and approximately 3,000 miles of new roads, trails and lanes have been constructed. This development made possible better protection of the area and opened up for recreation and utilization remote regions containing large quantities of valuable forest commodities.



THE LARGEST BUILDING IN THE FOREST ACADEMY GROUP

The products of the State forests are being utilized as rapidly as funds become available for carrying on the operations. Much hypermature material has been removed and marketed. The removal of dead, dying and damaged material is going on continuously, with the result that the composition of the treated stands is being improved and considerable revenue is realized. The following tabulation contains the amount of revenue derived annually since 1900 from the sale of forest products:

Year.	Amount.
1900	$1,227.87
1901	1,951.57
1902	1,578.70
1903	9,758.02
1904	1,373.94
1905	2,247.67
1906	5,001.24
1907	3,955.89
1908	2,473.76
1909	5,267.11
1910	9,176.09
1911	6,460.08
1912	12,585.67
1913	13,076.07
1914	15,066.64
1915	13,483.84
1916	21,459.97
1917	21,569.69
1918	24,410.24
1919	34,517.15
Total	$206,641.21

This statement shows how the income from the State forests has been increasing, and it is safe to predict that the achievements of the past are but a prelude to the real financial accomplishments of the future, when the young stands of forest trees which are now being established so carefully and developed so safely and in accordance with the principles of scientific forestry will have reached merchantable size and increased in value sufficiently to recommend their marketing.

FORESTS AS A FARM CROP

(*Continued from Page 338*)

softwood forest lands from which must come the lumber used for construction of buildings, cars, and other structures, and most of the pulpwood used for the manufacture of paper.

While, of course, part of the increase in lumber prices is due to the conditions that have brought about the general rise in the price level of all materials, part of it is due to the failure to keep productive the forest lands in the older settled parts of the country. Much can be done by the farmers themselves, through careful handling of their own woodlands, to protect the country against the consequences of the present methods of the lumber industry and keep at a reasonable level the costs of lumber and other forest products used by farmers.

The benefits of forestry are very real benefits. While wise use of up-to-date methods of growing timber on the part of farmers generally would mean a material increase in the value to them of their farms, it would also contribute very materially to the national welfare. It would mean not only greater production of wealth, but also of local supplies of material necessary for many industries. It cannot be emphasized too often that the country must have forests, widely distributed and abundant. It will not do for us to depend entirely on supplies that are thousands of miles away from the consumer.

By learning and applying the principles of forestry, as a part of intelligent agriculture, our farmers will make their forest property serve the national welfare at the same time as their own.

WHITE PINE "FLU"

BY JOHN N. WASHBURNE

"THIS is the first time I've seen your face in three years," I told Posey after I had glanced around his new office which the University of California had placed at his disposal in the Agricultural Building.

"You saw me last fall, didn't you?" Posey replied.

"Not your face. You had a 'flu' mask on at that time."

"So I did," he nodded seriously, "and do you know what this office is?—these cards and files and papers and specimens? It is the 'flu' mask of the Western white pine tree. There is an epidemic now rampant among the Eastern white pines, a blight gradually creeping westward, which is more fatal to the five-needled pine trees than was the Spanish influenza to the human species. For the White Pine Blister Rust—that is the name of the plague—is incurable once it gets a hold on a pine tree.

I thought of the California sugar pine—that finest timber tree in the world—and realized that it also was a five-needled pine. When I manifested my interest in the subject, Posey, who is officially known as Gilbert B. Posey, of the Office of Blister Rust Control, Bureau of Plant Industry, Department of Agriculture, Washington, took me over the office and explained some of the intricate and thoroughgoing work which he is doing for the Government.

CULTIVATED RIBES. TOBY'S PLACE. KITTERY POINT, MAINE

About twice natural size. Native white pine tree 12 years old, 6 feet tall, 2½ inches diameter at base. Showing top portion of 14-inch girdle extending from ground up.

The office has been made the headquarters for the Blister Rust Control work of 12 Western States. From it scouts are sent out all over the vast Western territory to look for the first signs of the encroaching menace. There are 3,000 linear inches of cards, each card bearing detailed information of the whereabouts of all white pine trees, gooseberry or currant bushes which have been shipped into California, Washington, Oregon, etc., in the last 20 years. The gooseberry and currant plants, Posey explained, carry the disease. In fact, the growth (for Blister Rust is a parasitic fungus) spends half of its life on a gooseberry or currant plant, and wherever these bushes (called Ribes) are exterminated the epidemic is at an end.

"I am going out on a scouting trip myself in a few days," Posey remarked. "A Mrs. Clemens, of the Sierra Club, reports signs of the plague down in the Yosemite. How would you like to come along?" I snapped up this proposition eagerly and made arrangements to meet him the following Tuesday.

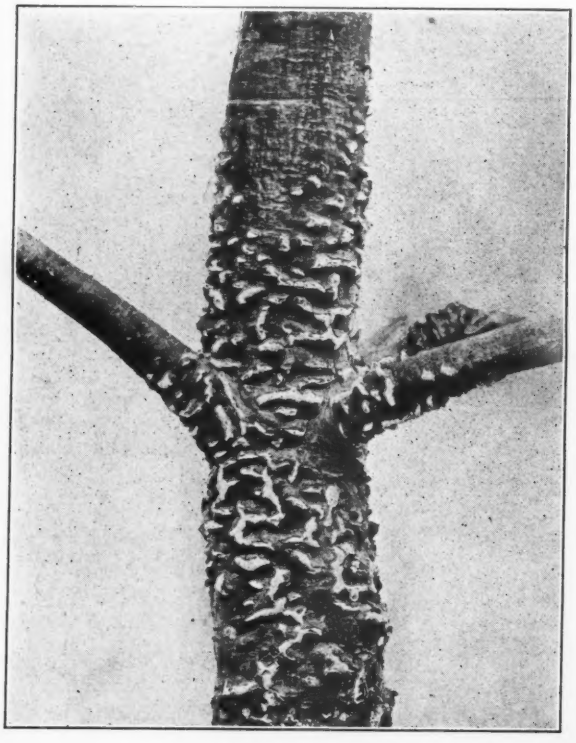
Nothing of interest occurred until our second day in the Yosemite. The first day we spent crawling about among some of the 60 varieties of wild currants and gooseberries that grow in California and looking on the under side of their leaves. But no sign of *Cronatium ribicola*, which is the scientific name for White Pine Blister Rust, could be found. At first I mistook every yellow-tinted speck for a symptom of the Rust and could scarcely tell a gooseberry bush from a Bull Thistle, but under Posey's coaching I soon began to make myself useful—at least, so I believed. That evening, and many subsequent evenings, we spent our entire time picking prickles from our hands.

The morning of the second day we made an early start for Snow Creek. Although statistics say that Snow Creek has an elevation of only 6,500 feet, it is difficult to believe. For the pass leading there is five miles long and is nearly perpendicular. All along the way we came across the two predominant species of Ribes—the flowering currant and prickly gooseberry. I grew to know them at sight, and took particular delight in discovering and pointing out to Posey those plants growing at the top of some slippery rock or steep, soft bank of earth. By the time we reached Snow Creek in the early afternoon Posey had done so much climbing that he sank down exhaustedly in the place we chose for our luncheon, without even glancing at the nearby gooseberry bushes.

"We'll inspect this place after chow," he said, opening the bundle of lunch which, was pathetically small in comparison with our appetites. While we made the best of the little we had, I asked Posey a few more questions concerning this enemy of plant life against which we were campaigning.

"As nearly as can be discovered," he answered my questions, "the blight originated in Siberia, spread

through Europe, and was brought to this country on imported nursery stock. Of course, now there is a strict quarantine against practically all imported plants, including all foreign Ribes and five-needled pines. Before it was realized it had hopelessly invaded the New England States and had gained a foothold in the Great Lakes region. Before we could check it, it spread West through Minnesota and even into the eastern part of North Dakota. But we stopped it there, and are now holding it



TYPICAL FATAL INFECTION

Side branch of native white pine, 15 years old, 7 feet tall, 3½ inches diameter at base. Side branch became infected from long infection on main stem which had girdled and killed main stem above. Branch 10 years old.

in check by strict precautions. Of course, it may have already invaded this country out here before we took the work in hand. If so, I do not know what can be done; you can see for yourself how impossible it would be to destroy all the currants and gooseberries in many parts of this country. I'm afraid if we find any of the Blister Rust out here the great Western white pine and sugar pines of California will suffer severely."

"See how thickly these things grow," he remarked, indicating a gooseberry bush not two feet away. Casually he snipped off a branch and glanced at the under side of the leaves. His eyes fastened themselves on the object in his hand.

"By God!" he exclaimed, "I believe this is it!"

He sprang up and began searching about. "Here's more of it!" he cried from a little distance. "Yes, and here's still more. There's quite a lot of it around here."

"Well," I asked when he returned, "does that mean that the pines of the West are threatened?"

"There is one hope. It may be the Pinon Pine Rust, which is harmless to white pines and in appearance is very similar to the true White Pine Blister Rust during the stage in which it is growing on the Ribes."

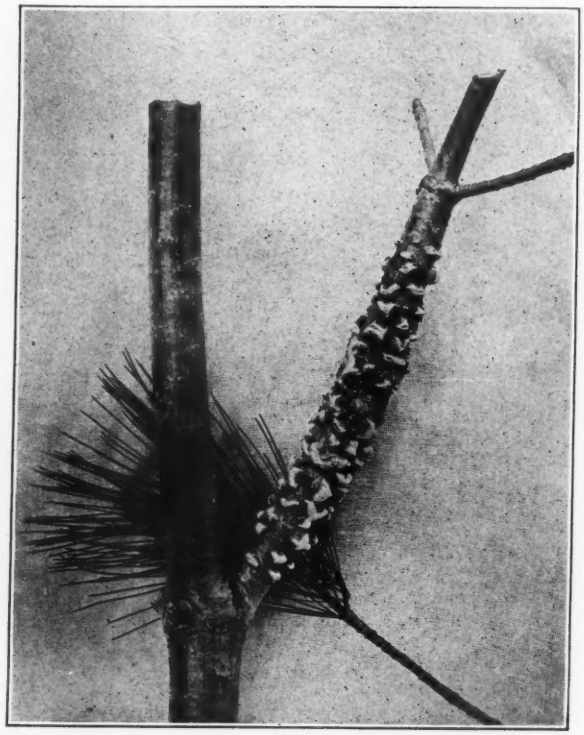
"Why not be optimistic then?" I advised.

"Because of the possibilities. Look about you. There are only sugar pines here. I do not believe there is a Pinon pine in 50 miles."

"I will have to go further with this thing than I had planned," he said presently. "When we get back to Camp Yosemite I will get in touch with a few of the men who are working with me and organize a camping tour to inspect all this country. Do you want to stick with us?"

I looked at my thorn-filled hands and thought of the small luncheon we had had. "I'll think it over," I replied.

But that night, at Tenaya Lodge, after I had ordered and eaten two complete dinners and was lying deliciously



SIDE BRANCH INFECTION

Small side branch of 15-year-old white pine at Kittery Point, Maine; 14 feet tall, 4 inches diameter at base. Fruiting on 4-year-old internode.

stretched out on my bed, I looked long out of the window. The pines drew solemn shadows in the silver of the moon. Their hushed, green fragrance lay upon the susurrous breeze. Their voice was in the room; and I felt their strength and knew the huge and quiet joy of their existence. All the beautiful night, from the leaves decaying on the ground to the breath of the sky, carressed and sustained these ancient, peaceful lives. They stood in serene and magnificent oblivion of their impending disaster. But *I* knew their danger, and knew that I could not go back to the city while the question of

whether they would be saved or would perish remained unanswered.

Ten days later we went to Merced, there to meet the men for whom Posey had telegraphed. When we arrived the supplies had been bought and everything was ready for the undertaking.

Harland R. Wilson, from Los Angeles, was there with his big seven-passenger car, which he had rigged out to be the ridge-pole as well as one of the walls of our tent—an ingenious contraption of his own which made camp pitching an easy matter. Wilson is a big, raw-boned, powerful man of about 45, ex-sheriff, ex-constable, ex-star football and baseball player, bronco-buster, botanist, woodsman and father of six children. Mrs. Wilson, genial and active, came along to cook the meals.

There was also Prof. A. O. Garrett, from Utah, a placid, elderly man with an encyclopedic mind and a vast knowledge of all plants. The fourth member of the party, who was so lively he might be counted as two members, was Henry N. Putnam, from Michigan, little, energetic, keen-eyed, and humorous, in love with the woods and with his work, a veritable ferret in the matter of finding whatever he sought.

At Wowona we found the same rust on the under side of the Ribes, and again at Mariposa. From there on an inspection was made every mile, and at each stop were found signs of the disease. Daily specimens were mailed to Washington for expert analysis, and as we continued our journey and found how wide-spread the disease had become we dreaded more and more the decision—the definite determination whether it was the harmless Pinon Pine Rust or the dreadful White Pine Blister Rust.

From the Yosemite we traveled over the Tioga road to Mono Lake and thence toward Lake Tahoe. All the way we found the rust, but none of the sugar or white pines betrayed symptoms of the disease. We crawled out along their branches, looking for the tiny fungus which feeds upon and blisters the bark, encircling the trunk like a felon, choking the life of the tree, and sometimes causing it to swell hideously as if suffering from some fantastic elephantiasis. But only the currants and gooseberries showed signs of the rust.

Finally, near Bridgeport, one early morning when Putnam was away looking for firewood with which to cook our breakfast, we heard a distant shout and went to investigate. After much "halooing" we came upon a great Pinon pine and on one of its branches was Putnam.

"I've found it," he shouted. "Here it is—thick! It's the Pinon Rust, all right, I'll bet 10 to 1."

We looked about and found that every currant and gooseberry plant within a radius of several miles was covered with the rust. And during that day as we drew farther away from the group of Pinon pines the rust on the Ribes became scarcer.

"I think it is conclusive," said the Professor, "the farther the wind has had to carry the spores the thinner the rust becomes on the Ribes. It is very encouraging, anyway."

Indeed, it was so encouraging that Posey and I returned to San Francisco that night while the others continued their campaign.

The next morning I telephoned Posey in his office.

"Have you heard from Washington?" I asked.

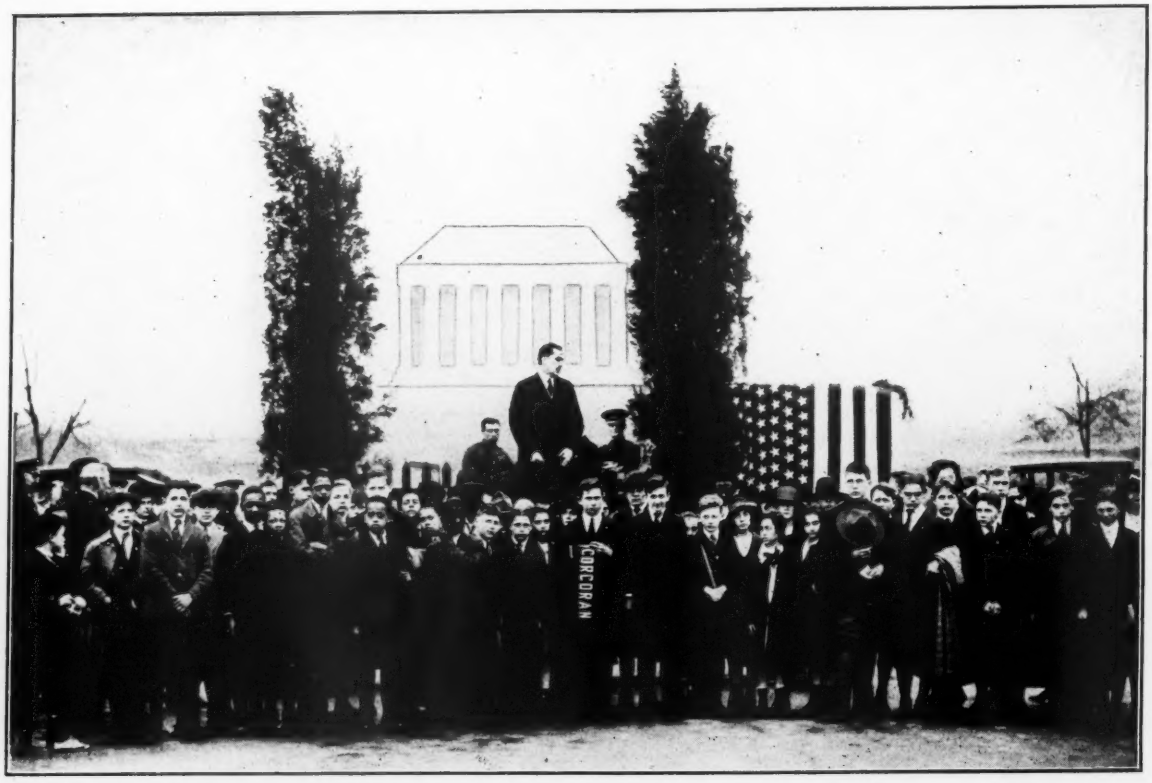
"I have," he answered, "and I have telegraphed the news to the Professor and Wilson and Putnam. The Department of Agriculture writes that all the specimens they have received have been Pinon Pine Rust."

"Put 'er there, old man!" I cried, forgetting that I was in San Francisco and he was in Berkeley.

HOW A BUILDER RESPECTED A TREE

By Helen Harrison

IT is not always necessary to sacrifice full-grown trees when business blocks begin to crowd out residential sections. The owner of this property built around the half-century-old elm tree, rather than fell it, a fate that met hundreds of similar trees in Bridgeport, Connecticut, when one of the principal streets was widened. The space taken up by this tree has been well camouflaged inside the building by a shallow cupboard effect. Who knows but the lines "Woodman, spare that tree," learned at the old brick schoolhouse, may have been the influence at work when the owner, the late George C. Edwards, formerly president of the International Silver Company, gave instructions to his architect to build around this tree.



THE DISTRICT OF COLUMBIA CELEBRATES ARBOR DAY *National Photo.*

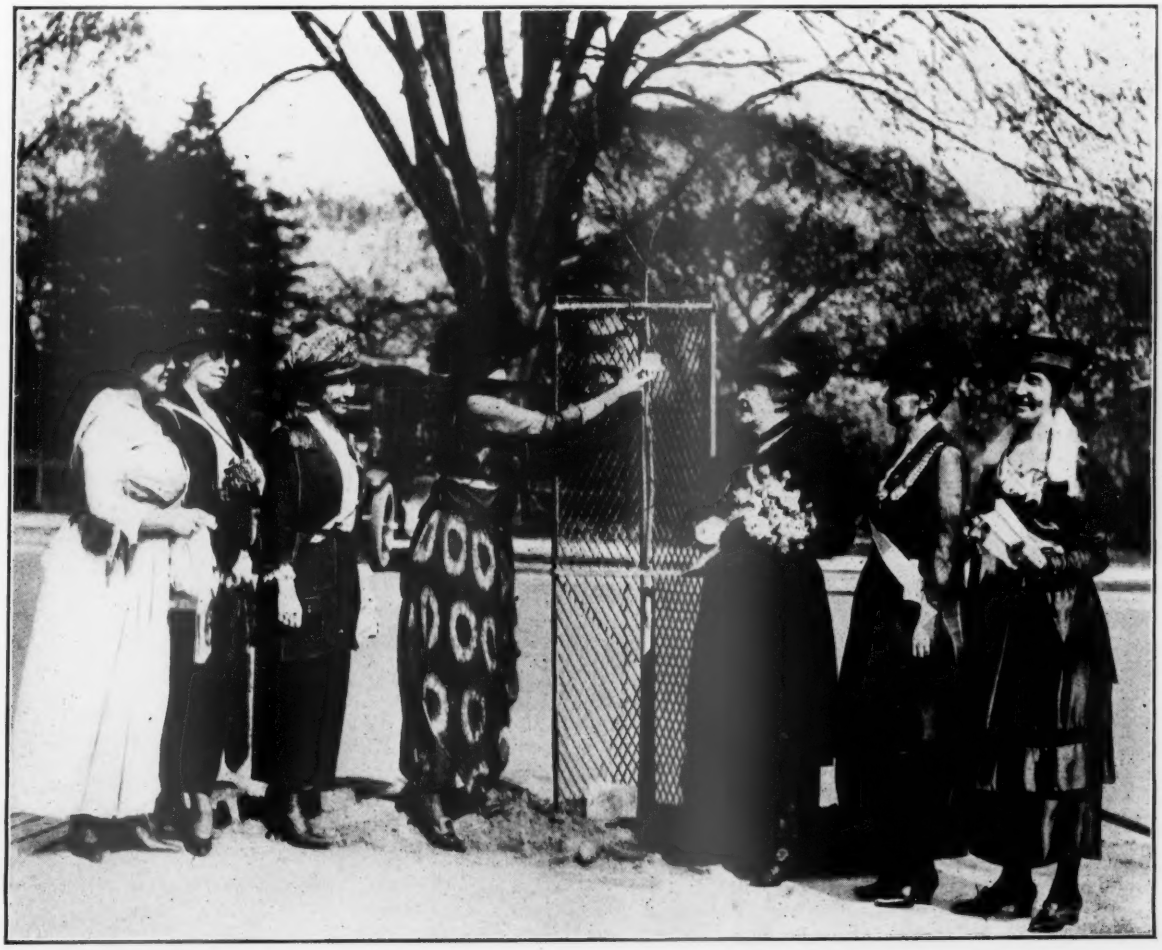
The first Arbor Day the District of Columbia ever observed officially was on April 16, the day having been set apart by proclamation of the Commissioners. Tree planting across the drive from the Lincoln Memorial was the District's part in the days plan. Secretary of Agriculture Meredith shown here speaking was the orator. Each public school class was represented by a pupil, and this delegation is shown in front of the speaker's stand. Clifford I. Lanham, the superintendent of trees and parking, had charge of the ceremony, and the first tree was planted in memory of his father, who for 25 years held the position the superintendent now has.

MEMORIAL TREE TO ANIMALS AND BIRDS *National Photo.*

The first tree planted in memory of the birds and animals killed in the war to be registered on the honor roll of the American Forestry Association was placed at Happy Hollow playgrounds, Washington, D. C. Children gave the program of the American Forestry Association for tree planting. James P. Briggs of the Humane Education Society made an address and the tree was marked with the bronze marker designed by the Association. The tree planting was the big feature of "Be Kind to Animals" Week.

LIVING MEMORIALS

THE District of Columbia had its first official Arbor Day on April 16. It was ordered by the Commission in a formal proclamation. The day was widely observed. Clifford I. Lanham, superintendent of trees and parking, provided a fine program with the planting of trees along streets, the first of which was a tree in memory of his father who for 25 years held the position of the District of Columbia in memory of the animals in the war. One of these trees was at the Happy Hollow Playgrounds. The ceremony at Happy Hollow was unique indeed. Children bearing large letters that spelled "Be Kind to Animals" accompanied by Girl Scout Troop No. 1, marched to the spot where the tree was placed. The program of the American Forestry Association for



THE PIN OAK FROM MOUNT VERNON PLANTED BY THE NATIONAL SOCIETY OF THE CHILDREN OF THE AMERICAN REVOLUTION

Mrs. Daniel C. Lothrop, who founded the National Society of the Children of the American Revolution 25 years ago, turned over to Mrs. Frank Mondell, the newly elected president, the memorial tree planted by the society and registered on the National Honor Roll of the American Forestry Association. Mrs. Lothrop is shown with the bouquet of flowers and Mrs. Mondell, the wife of the Representative of Wyoming, is holding the marker. The other national officers in the picture are Mrs. Horace M. Towner, wife of Representative Towner of Iowa, Mrs. Percy M. Bailey, Mrs. G. M. Brumbaugh, Miss Grace Pierce, and Miss H. E. Stout. The sessions of the National Society of the Children of the American Revolution were held co-incident with those of the sessions of the Daughters of the American Revolution in Washington. The tree is a pin oak from Mount Vernon.

his son now holds. Secretary of Agriculture Meredith was the speaker of the day. A delegation of school children, an appointee from each class, was present at the ceremonies. Commissioner Brownlow introduced the speakers, who were Secretary Meredith and General William Mitchell of the United States Air Service.

As one of the features of "Be Kind To Animals" Week, which date coincided with Arbor Week, memorial trees were planted by the Humane Educational Society tree planting was carried out by the children. Mrs. Ira Bennett was chairman of the committee of arrangements. The National Society of the Children of the American Revolution planted a memorial tree on the grounds of Continental Memorial Hall during the sessions of the Daughters of the American Revolution. Another tree was planted on the grounds of the Marine Hospital in memory of Charles A. Rhett Jacobs of the Marines who was killed in action in France. On May 4 the District Federation of

Women's Clubs planted a tree in memory of J. Sterling Morton, the father of Arbor Day in the United States.

At the bi-enniel convention of the General Federation of Women's Clubs in Des Moines in June the conservation department under the direction of Mrs. Mary K. Sherman, gave a big part of its program to memorial tree planting and making of plans for a nation-wide campaign for encouraging it.

The planting of fifty-three live oak trees as living monuments to the sons of A. and M. College of Texas who died in the service of their country in their efforts to perpetuate the liberty that had been their heritage, was the occasion of a simple, but most impressive ceremony. Several hundred cadets assembled in front of Guion Hall. President Bizzell, five members of the Board of Directors, President L. J. Hart, W. A. Miller, Jr., John T. Dickson, J. R. Kubena and H. A. Breiham, together with a number of faculty members, were grouped on the steps of the building. Dr. John A. Held, pastor of the First Baptist Church of Bryan, invoked the blessings of the Almighty on the crowd assembled. The College Band played the English Anthem, "God Save the King." President Bizzell then introduced the speaker of the day, L. J. Hart, of San Antonio, President of the Board of Directors. At the close of his address Professor R. F. Smith read the names of fifty-three men, members of the Federal and College students, Alumni and faculty, who were each placed in charge of a squad of four cadets to plant a tree for one of the heroes. As the band played the French National anthem, "Marseillaise," the squads under their leaders marched to a tree planting site, and as the notes of the American anthem were played the earth was placed around the roots of the trees. When the work was finished taps was sounded. And immediately following came the "Star Spangled Banner," bringing the crowd to attention. When the last note was sounded the meeting was dismissed.

Following the calling of the roll President Bizzell announced that at the meeting of the Board earlier in the day it had been decided to plant one tree in honor of A. B. Davidson, former Vice-President of the Board, who died recently, so immediately following these exercises President Bizzell took the five members of the Board to a place near the entrance to the College grounds and there planted one live oak tree in memory of this distinguished citizen of Texas.

Mrs. Blanche Bellak of Philadelphia and Washington is setting a fine example to war mothers by her planting of memorial trees for her son, Joseph Faussett Bellak, U. S. N. Mrs. Bellack is taking a keen interest in all affairs of the American Legion and the Patriotic Order of the Sons of America and has been of great help to the organization of the Joseph Faussett Bellak Post No. 195 of the American Legion in Philadelphia. Mrs. Bellak planted a gold star tree in the south side of the churchyard of historic Christ Church, Second Street, above Market, in Philadelphia, in memory of her son, Lieutenant Bellak, the only member of the congregation of that church to lose his life in the war. The tree, an English elm, is a gift to the church by Mrs. Bellak, who had it brought from Oxford, England. The Joseph Faussett Bellak Post No. 195, of the American Legion, attended the service in a body, as did the Patriotic Order of the Sons of America. The post is composed of men who served in the Navy during the war. The dedication was by Dr. Louis C. Washburn, rector of Christ Church. Chaplain Curtis H. Dickens, of the Navy Yard, made a brief address. The dedication ceremonies followed a memorial service in the church in honor of the 139th anniversary of the inauguration of George Washington

Photograph by Rau.

THE "GOLD STAR" PLANTING AT HISTORIC CHRIST CHURCH

This English elm was planted by his mother, in honor of the memory of Lieut. Bellak, U. S. N., following an impressive memorial service at old Christ Church in Philadelphia. The gold star for Lieut. Bellak is the only one on the bronze memorial tablet of this famous old church.

as President of the United States. It also marked the 225th anniversary of the church.

The forestry committee of the Civic League of Texarkana, Texas, of which Mrs. C. S. Hutchins is the chairman, planned a ceremony for honoring the memory of John C. Watts, the first Texarkana boy to die in France. Every member of the Watts family resident in Bowie County placed a little earth brought from the home place, around the tree. Superintendent George H. Carpenter dedicated the tree and Judge R. B. Levy delivered the memorial address. The students formed in a semicircle around the tree, while a representative of each class deposited a portion of the dirt. Mrs. Hutchins read the honor roll and placed a few violets in the earth.

The most widely observed Arbor Day in the history of Maryland was that of this year. Through the keen interest of the Park Board and the School Board of Baltimore, approximately 80,000 public school scholars went to the public parks and assisted in planting trees. One hundred and fifty-eight schools had part in the work. Superintendent Koch, of the city schools, provided that pupils reassemble, as always, at 1.30 P. M. at their respective schools and go to the planting places. There were addresses to the school pupils by members of the Park Board in the parks and surrounding squares. J. Cookman Boyd, president of the Board, spoke in the Druid Hill Park district; General Felix Agnus, in Clifton Park and nearby squares; Edward Hanlon, in the Hanlon and Gwynns Falls Park district, and Theodore Mottu, in the Carroll Park district and J. Harry Gross, former engineer, to the Park Board.

At Middletown, Delaware, tree planting exercises were held on the high school campus. Mrs. H. B. McDowell, chairman, had charge. The children sang "The Planting Song," which was followed by an address by Superintendent Wilbur H. Jump. The poem, "Trees," written by Joyce Kilmer, who died in France, was recited by one of the children, and "What the Trees Teach Us," by fourteen children. The Rev. F. H. Moore dedicated the three trees with appropriate remarks; the linden, to J. J. Hoffecker, Jr., of Company B, 9th Infantry, who was killed in battle near Soissons; the maple, to Rupert M. Burstan, of the marines, who died of pneumonia six weeks after reaching France; the catalpa, to David Manlove, who fought in several battles, went over the top safely—then, after the armistice was signed, was killed by an exploding shell while engaged in reconstruction work. At the conclusion of the exercises, Dr. Moore and a

Underwood & Underwood.

MEMORIAL TREE IN HONOR OF BRITISH SOLDIERS

Memorial trees are being planted in Great Britain. The planting of which this is a photograph was at Manchester, England, where the Lord Mayor, Tom Fox, is placing a tree in memory of the boys of the Blackley Municipal Schools who gave their lives to their country in the Great War.

MEMORIAL TREE PLANTING BY THE TEXAS HIGH SCHOOL AT TEXARKANA, TEXAS

Memorial tree planting by the Texas High School at Texarkana, Texas, was done in honor of John C. Watts, the first Texarkana soldier to die in France. Every member of the Watts family living in Bowie County placed a little earth brought from each member's home around the tree.

number of the ladies went to the negro school where a maple was planted, dedicated to the memory of Jeremiah Jackson, the only negro boy from Middletown who died in the service. The Rev. M. Parker, pastor of the Browntown Church, made the address.

A linden tree was planted on the campus of the Woman's College at Newark, Delaware, by members of the Waverly Club of Hockessin, in memory of the heroes of the world war. Miss Sara Eastburn, president of the club, headed the work and was assisted by Miss Dora Wilcox, of the faculty; Miss Ruth Messick, president of the senior class; Miss Marie La-Gates, president of the junior class; Miss Elizabeth Taylor, president of the sophomore class, and Miss Rachel Kegerreis, president of the freshman class. The Gordon Heights Community Club observed Arbor Day by planting trees on the community ground. Four trees were planted in honor of four of Delaware's sons who gave their lives in the war. The trees were dedicated to the memory of Louis Thorpe, Watson Lenderman, Thomas W. Eaton and Edgar Chalfonte.

In thousands of communities along the Lincoln Highway trees were planted. At many of the services, the trees were dedicated with appropriate exercises to the men who gave their lives in the World War. Perhaps the one organization most interesting in the beautifying of the Lincoln Highway is the General Federation of Women's Clubs of America, and many club members participated in the exercises.

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GOVERNOR EDWARDS PLANTING A TREE

At Trenton, New Jersey, the Governor of the State planted a tree on Arbor Day in memory of the soldiers of the State who died in the Great War.

Underwood & Underwood.

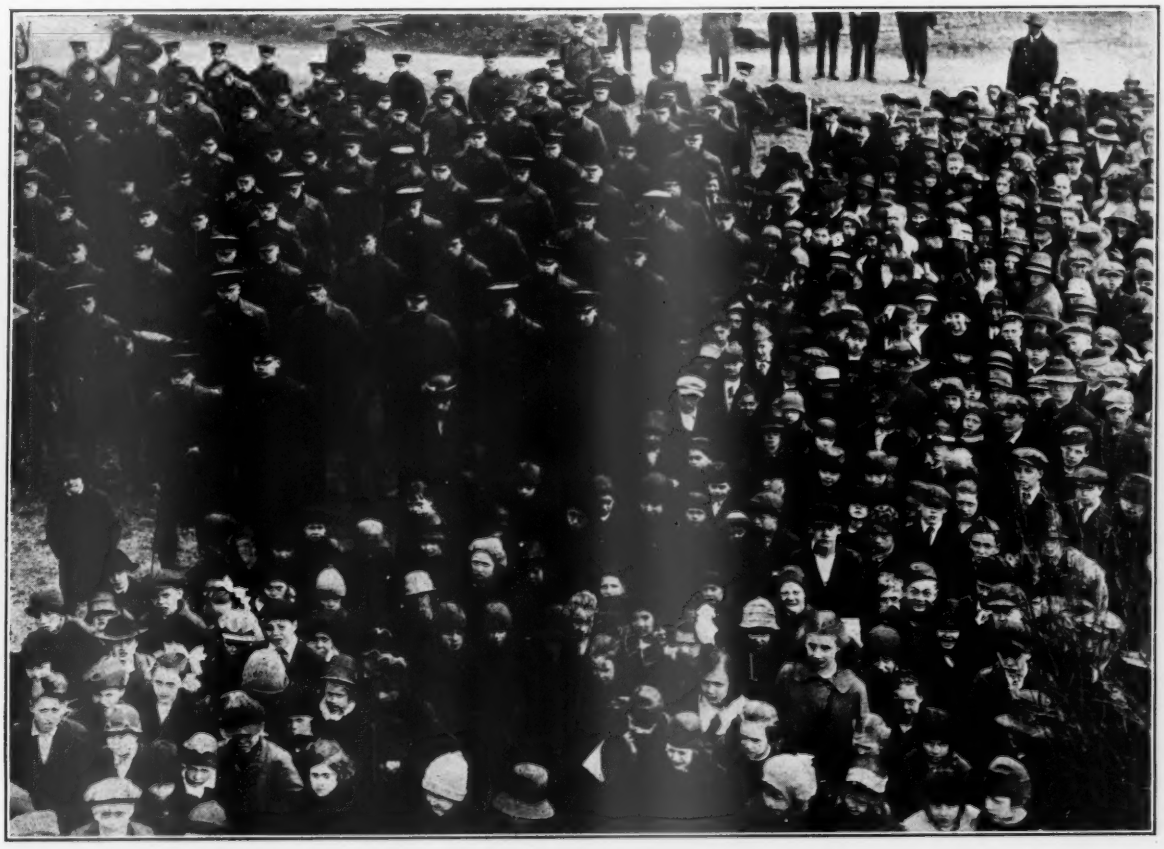
FOR NEW JERSEY DEAD

Attorney James Hammond planting a tree on the Brunswick, New Jersey, Pike, in honor of the soldier dead of New Jersey. The ceremony was held on Arbor Day.

At Bordentown, New Jersey, the Bordentown Military Institute placed twenty-two trees in memory of the Institute's boys who gave their lives in the World War. Colonel Thomas D. Landon, the commandant, arranged the program which included an address by Judge H. B. Wells. Maxwell Emerson, a nephew of D. Edgar Maxwell for whom one of the trees was planted, gave a recitation and the public school pupils rendered "What the Trees Teach Us." Rev. James Burns offered the prayer and the tree song from the American Forestry Association's program were sung. All of the 22 names have been registered on the national honor roll.

Tree planting activities have really but begun. The living memorial is appropriate to any and all memorial plans whether it be the single tree or a "Road of Remembrance." The "Road of Remembrance" idea has been taken up most heartily. The Association's suggestion that the Bankhead Highway be made a "Road of Remembrance in honor of the late Senator John H. Bankhead has received the most welcome editorial comment throughout the South.

A great Liberty Memorial Park was proposed by the Daughters of the American Revolution in Congress at Washington, D. C., in April. This follows the lead of the American Forestry Association, which organization has suggested to Governor Westmoreland Davis, of Virginia, that the highway to Mt. Vernon, the nation's shrine, be made a great "Road of Remembrance" and become a unit of the drives that should lead to such a memorial park as the Daughters of the American Revolution sponsor. The Association urges that Governor Davis invite the states to plant memorial trees along the highway to Mt. Vernon. Connecting as it does with the beautiful drive to Arlington, the drive in Potomac Park and the proposed river drive from Potomac Park to Rock Creek Park, the nation's capital has the greatest of opportunities to erect a memorial to the heroes of the World War such as no other world capital can hope to duplicate. The plan of the Daughters of the American Revolution called for the construction of a highway connecting the city of Washington with the park, which would be called Liberty Memorial Highway, and the suggestion was made that the park be used for study and experiment in forestry and agriculture and for the establishment of vocational schools. The resolution asks the United States Congress to appropriate money for this project, and to place the selection of the site and the development of the lands in the hands of a Liberty Memorial Park Commission, to include the Secretary of



Underwood & Underwood.

MEMORIAL TREE PLANTING FOR SOLDIERS AT BORDENTOWN, NEW JERSEY

To perpetuate the memory of men from the Bordentown Military Academy who fell in the war, memorial tree planting exercises were held at the academy on Arbor Day. Children of the city and Bordentown cadets participated in the exercises.

War, the Secretary of the Navy, the Secretary of Agriculture, the president general of the D. A. R., the president of the Sons of the Revolution, the president of the Sons of the American Revolution and three others.

The Club Women of Atlanta, Georgia, claim the distinction of having planted in one of the parks of that

STREET PLANTING OF MEMORIAL TREES

On Central Boulevard at Kewanee, Illinois, 31 memorial trees have been planted by the Women's Relief Corps, Mrs. Ada M. Taylor reports to the American Forestry Association. These trees have been named for the 31 heroes who gave their lives to their country, and the names have been entered on the Association's Honor Roll. The American Legion, G. A. R., and the Spanish War Veterans all had part in the ceremony. The trees were marked with a wreath, and later will be permanently marked.

city the first Authors' Grove in the United States. The unique idea first occurred to Mrs. Lollie Belle Wylie, whose original purpose it was to plant, each year, several trees in honor of favorite authors, under the auspices of the Atlanta Writers' Club, of which she is the president. The idea grew out of the desire that the Writers' Club, although primarily an organization engaged in creative work, should share in the civic welfare work of the community in which it exists.

No sooner was the plan announced than comments were made in all the daily papers, and interest immediately spread from one group of women to another, who in turn, asked that they too be allowed to share honors with the Writers' Club in planting memorial trees.

Eighteen of the most prominent clubs of the city entered with enthusiasm into making plans for Tree Planting Day. Eight more trees have been planted since the original eighteen were set out and the committee is steadily receiving letters asking for information from both clubs and individual tree lovers who wish to place a living monument in the grove, in memory of some beloved author. From present indications there will be a hundred trees growing in the authors' Grove a year hence.

The authors honored were: Jack London, Edgar Allen Poe, Joel Chandler Harris, Shakespeare, John Maysfield, Corra Harris, Frank L. Stanton, Granville Barker, Henry Brady, Martha Rutherford, Bill Arp, Emma LaZarus, Mrs. William Lawson Peel, Thomas Skeyhill, Harry Harmon, Charles W. Hubner, Edward McDowell, Lucian Lamar Knight, Virginia Arnold, Helen Gray, Dr. George Niles, Father Ryan, and Mrs. Lollie Belle Wylie, the mother of the movement.

The organizations which planted were: The Atlanta Writers' Club, the Atlanta Woman's Club, Joseph Habersham Chapter D. A. R., Colonial Daughters, U. D. C.,

A MEMORIAL TO CZECHO-SLOVAKIANS

Novel in the way of a memorial tree is a lipa, the Czecho-Slovak national tree, which is growing in Balboa Park in San Diego, California, to commemorate the visit of several large detachments of soldiers of that nation, returning to their homes after service in Siberia. The soldiers arrived at San Diego by transport direct from from Vladivostock and remained at Camp Kearny during a period of recuperation, after which they proceeded to the Atlantic seaboard. In the years to come, this tree is certainly entitled to a place in the Hall of Fame. A tablet placed near the lipa tree reads as follows: "Planted in commemoration of their independence and in memory of the sons of Czecho-Slovakia for their great sacrifice in the World War for justice and liberty. Dedicated July, 1919, when the Czecho-Slovak army visited our city on their homeward journey from Siberia, by the Czecho-Slovak National Alliance of San Diego."

Atlanta Music Study Club, New Era Study Club, Woman's Pioneer Society, Council of Jewish Women, Woman's Study Club, Modern Topics Club, The Reviewers, Daughters of 1812, Uncle Remus Association, Altar Society of Sacred Heart Church, Southern Mountain Association, Ladies' Board of Oglethorpe University, Nineteenth Century History Class, Drama League, Shakespeare Club, and individuals.

"HALL OF FAME" FOR TREES

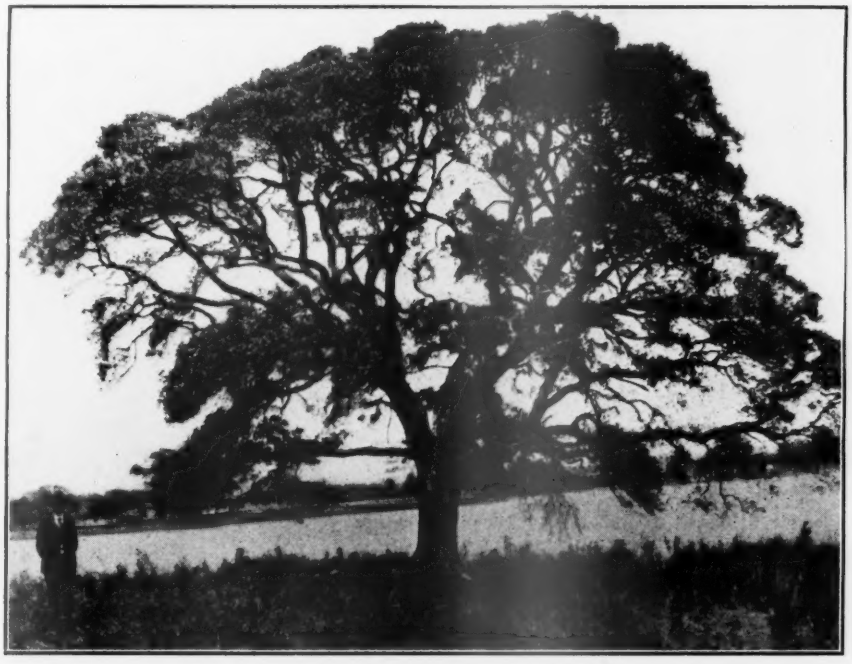
Here is a tree that goes back to the days of pirates bad and bold, according to the data submitted by A. D. Dart, of Oriental, North Carolina. "Teach's Oak" is the name of this tree and Teach was a bad, bad man—so much so that even now the boys dig about the neighborhood of the tree for treasure.

In the early Colonial days, long before beacon lights were placed at the entrance of harbors to make the channels, prominent objects like big trees, had to serve for that purpose, and even now, as then, this old tree is a landmark and guide for sailors frequenting these waters.

Edward Teach, the notorious pirate—called "Blackbeard," because of the bushy black whiskers that covered his face, was born in Bristol, England, about 1690. Early in life he was a private sailor on a vessel commanded by one Kornagold, a noted sea rover in European waters. The latter having captured a large merchant vessel in 1718, put Teach in charge, and he seeking pastures new, started for the American coast, making captures on his way of many defenseless merchantmen. His favorite cruising ground was along the coasts of Virginia and North Carolina, seeking refuge, as occasion demanded, in the quiet waters of Albemarle and Pamlico Sounds and their tributaries, either to avoid severe storms or when pursued by war vessels. The latter were few in number during those days, and were generally of such deep draught that it was impossible for them to follow the piratical craft into shallow waters.

While the Pirate Teach has left no record of his exploits, it is only fair to assume that he must have obtained a great quantity of valuables of all kinds, from the many vessels he is known to have captured and sunk. If there are sermons in stones, and books in the running brooks, there certainly must be history in the old Water Oak shown in the accompanying picture, for it is a well established fact that "Blackbeard" and his villainous crew often frequented this point, and sought refuge and rest under the spreading branches of this famous tree, which for generations has been known as "Teach's Oak." So strong is the belief that much of his booty was buried under the tree, that great holes have been dug in many places around it, but as far as known no treasure has ever been found.

Finding it a hopeless task to capture the pirates who were committing so many depredations along the coast, the English king offered a pardon to all who would surrender and lead honest lives. Teach accepted the proposal and settled in Bath, a small town in Beaufort County, but the lure of the sea was so strong, and, becoming tired of such a quiet life, he very soon raised his black flag, and sailed away to once more become the terror of the seas.



TEACH'S OAK

Learning that his vessel was anchored in Ocracoke Inlet, near a small island of that name, on the North Carolina coast, Governor Spotswood, of Virginia, sent Lieutenant Maynard in search of the pirate.

The two met, and, after a desperate sea fight, Teach was killed, his head cut off and tied to the bowsprit of Maynard's vessel.

The body was thrown overboard, and according to the tradition of the Island, his muscular strength was so great that the headless body swam entirely around the Island!!—Presumably searching for his crew and vessel.

"HALL OF FAME" FOR TREES

In Audubon Park, New Orleans, stands a tree deserving of much attention. It is a gigantic live-oak and has been nominated for a place in the Hall of Fame for trees by Miss Viola Overman.

This oak is famous for four reasons: For its beauty; its name—Washington; its many yearly visitors; its size, for it is conceded by botanists and tree-ologists to be the largest live-oak in the world.

This tree has a rival. This rival is a venerable oak near Charleston, South Carolina. It, too, is known as the

THE WASHINGTON OAK

Washington Oak. The pretty story concerning it is as follows:

In the summer of 1791, at the time of the memorable pilgrimage of President Washington throughout his beloved Southland, he was an honored breakfast-guest in the beautiful suburban home of Mrs. Horry—of the distinguished Pinckney family.

President Washington heard the mistress of the household give an order to her gardener that the large oak which obstructed the view from the new portico must be cut down. The President—great tree-lover that he was—interceded with his hostess to spare the condemned oak.

Mrs. Horry could do naught but to accede graciously to the slightest wish of her distinguished guest. The gardener was summoned. The President's wish was told to him; the President's wish was Madam Horry's wish—the tree was spared.

The last account was that this Washington Oak is still alive. And is the object of much interest to Northerners as well as Southerners.

"HALL OF FAME" FOR TREES

At Admiral Peary's college, Bowdoin, Brunswick, Maine, is the Thorndike Oak, which has been given a place in the Hall of Fame. In nominating the Oak, Gerald G. Wilder, the Bowdoin Librarian, says:

"At the close of the first of the Chapel exercises, one of the students, George Thorndike, thrust an acorn into the ground, and half in earnest, half in jest, said a great tree

THE THORNDIKE OAK

would flourish long after he had gone. He died in 1811, in Russia, the first Bowdoin graduate to die, and the Thorndike Oak is still flourishing and year after year shelters the Seniors on Class Day. The date of the first of these chapel exercises above referred to is September, 1802. The tree was transplanted in 1803 from its original position near Massachusetts Hall to the President's garden where it has since stood." It will be easy to understand the veneration in which the old grads of Bowdoin wherever they may be, hold that tree which is so closely identified with their college life.

THE EGGS OF BIRDS

BY ELSA G. ALLEN

ONE cannot find among the multitude of wonders in nature anything more marvelous than the development of an egg. Whether it be a butterfly which flourishes for a day only to die after depositing its eggs, or a reptile which lazily leaves its eggs with only the warm sand to mother them, or a fish, like the salmon, which, with incredible strength, jumps the rapids to spawn in the upper reaches of rivers, or most appealing of all, a bird which builds a beautiful nest for its treasures, the egg in every case is structurally the same, and the miracle of life unfolds according to the same laws of cell division.

A single cell marks the beginning of every organism. It divides into two cells, then four cells, and so on through the most intricate specialization of groups of cells. At last the perfected embryo, having used up the mass of food stored within the egg, must hatch and seek its livelihood in the great world where a thousand dangers beset it. For it is the most relentless law of nature that everything must struggle for existence, but another law provides that those forms which are subject to the most dangers produce the greatest number of offspring. Thus the progeny of many insects must number trillions that some may survive the birds which consume them by countless thousands. The cod risks its spawn to the open sea and must therefore produce millions of eggs that enough may survive to continue the species. The reptiles lay comparatively few eggs but likewise give them no protection, leaving them to be hatched by the heat of the sun or decaying vegetation. But in the realm of birds parental care for the eggs reaches its highest development.

Photograph by A. A. Allen.

NEST AND EGGS OF THE BLACKBURNIAN WARBLER

Birds which do not lay protectively colored eggs conceal them in well-hidden nests.

For as birds evolved from reptile-like ancestors and developed a constant body temperature, so their eggs, in order to develop, had to be kept continually warm. Because of this, nearly all birds, except the mound birds of Australia and the brush turkeys of New Guinea, incubate their eggs and herein lies the most fundamental difference between the eggs of birds and those of their ancient progenitors, the reptiles.

But while the eggs of reptiles with their white leathery shells are by no means beautiful, the eggs of birds are among the loveliest things in nature, and they have always held a great fascination for man. From the tiny hummingbird's egg, no longer than a bean, to the giant ostrich egg, which is between five and six inches in diameter, there is every gradation in size. But the size of the egg does not depend entirely upon the size of the bird which lays it. For example, the catbird and spotted sandpiper are practically of the same size but the sandpiper's egg is considerably larger. The reason is not difficult to find, for the young catbird upon hatching is still but poorly developed, tiny, helpless, featherless, homely to a pitiful degree, while the young sandpiper greets the world covered with down and ready to chase flies with its mother.

In like manner the length of the incubation period depends largely upon the stage of development reached by the chick before hatching. Birds such as the catbird and other perching species; which have altricial young needing care in the nest for some time, do not incubate their eggs as long as those like the shorebirds and ducks which have precocial young. The eggs of most of our common small birds require incubation for from ten days to two weeks. Those of the fowl-like birds such as the ruffed grouse about three weeks, those of the ducks about four weeks, and the eggs of the emeu, a large

ostrich-like bird of Australia, must be incubated for about ten weeks.

Much of the fascination of bird study lies in the questions which continually come to mind. Why do

Photograph by A. A. Allen.

A SPOTTED SANDPIPER AT HER NEST

The eggs of the sandpipers are large because the young are well-developed when hatched, being able to run about as soon as dry.

many of the sea birds lay only one egg and why must the ducks and partridges lay nearly a score? Why are some eggs pure white while others are most brilliantly

Photograph by A. A. Allen.

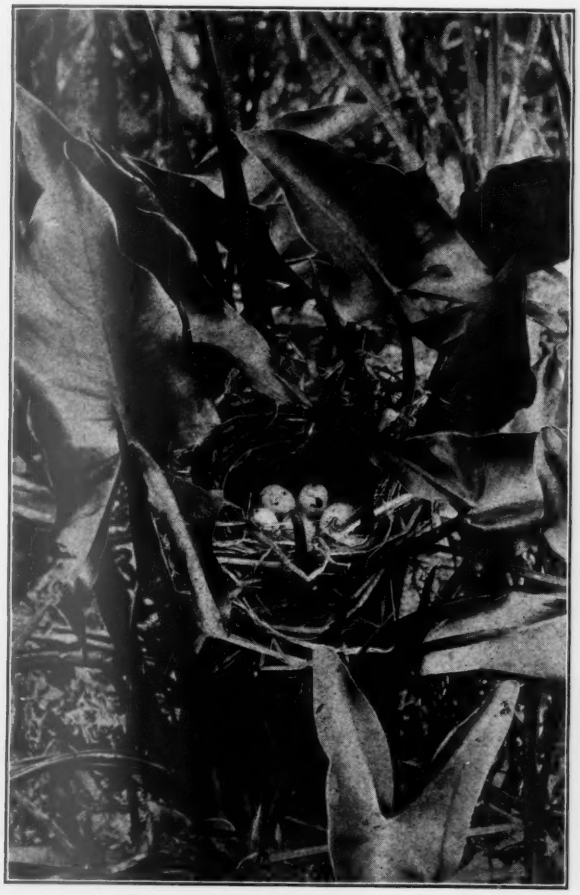
THE UNPROTECTED EGGS OF THE KILDEER

The kildeer lays her eggs on the bare gravel. They are very inconspicuous, however, because of their protective coloration.

colored and still others mottled with shades of brown like the sun-flecked forest floor?

The number of enemies which a bird has seems to control to a large extent the number of eggs which it lays. The auks, murres, and gannets, by their habit of retiring at the nesting season to isolated cliffs and islands, are comparatively safe from harm and therefore lay but a single egg. At the other extreme are the gallinules, ducks, and partridges with their ten to twenty eggs. Not only have these birds many enemies among the predatory animals, but, since they nest rather early in the spring their eggs are frequently flooded out by storms. Fortunate it is, if a clutch of eggs is successfully hatched, that the brood is large for it is more than likely that several of the young will be the victims of snapping turtles, snakes, and hawks.

This brings us to the coloration of eggs, which pre-



Photograph by A. A. Allen.

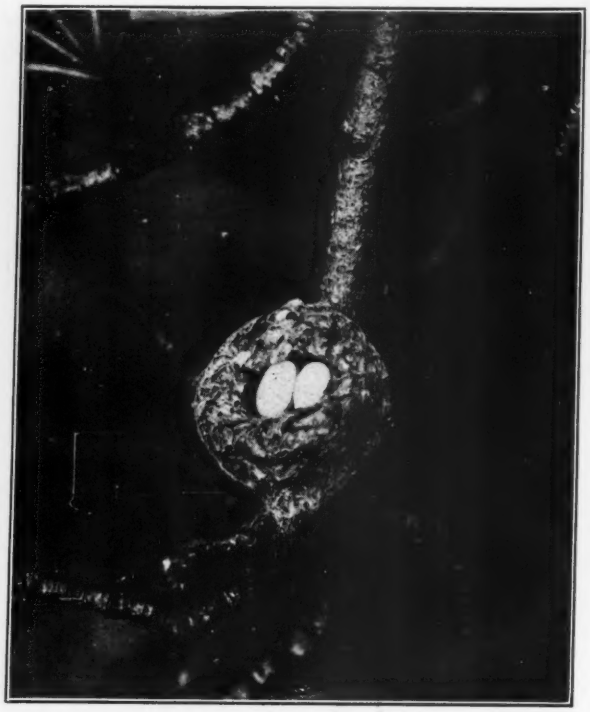
NEST AND EGGS OF THE RED-WINGED BLACKBIRD

The eggs are pale blue, streaked and spotted with dark purple and black, chiefly about the larger end. The addition of color and markings is the last stage in the formation of an egg. They are added slowly before the egg is laid.

sents problems more difficult to explain. We have heard a great deal about protective coloration in nature, and when we consider the advantages which accrue to protectively colored eggs we may wonder why some eggs have remained pure white through the ages, why others are of the most conspicuous greenish blue, and why still others stand out by their spotted or speckled patterns. We should bear in mind that white eggs are for the most

part laid by hole-nesting species of birds like the owls and woodpeckers, and since the eggs are well hidden in their dark cavities it has not been necessary for them to develop protective coloration. The bright greenish blue eggs of most of the thrushes, for example, must be hidden in nests which are concealed in dense vegetation and the speckled eggs of the ground nesting sparrows depend for their safety upon the good hiding of the grass-woven nest which contains them.

As one proceeds with the study of birds' eggs he will observe that each family of birds lays eggs of a certain type though some exceptions like the white eggs of the



Photograph by A. A. Allen.

THE NEST OF THE DAINTY HUMMING-BIRD

The eggs of this most exquisite of our little feathered friends are no larger than beans.

indigo bunting do occur and have yet to be explained. Thus the ducks lay plain colored eggs only slightly tinted with brownish, or greenish, or bluish. The shorebirds on account of building no nests, or very shallow ones, lay brownish spotted eggs which closely resemble their environment, and each family of landbirds likewise has its own type. The majority of the flycatchers, warblers, and vireos, for example, lay eggs which are white or whitish in ground color, the main differences being in the color and arrangement of their dots and speckles.

It is not surprising that these delicately fashioned wonders of nature should have lured thousands into the sport of egg collecting. But as we have gained a greater appreciation of the beauty and value of birds we have grown to consider egg collecting, except for scientific purposes, little better than wanton plunder, and today public sentiment protects the birds' home far better than all the fines imposed by law.

There is still another way, however, by which to enjoy the discovery of a bird's nest, a way more permanent

Photograph by A. A. Allen.

A BUSY MOTHER GALINULE

The Florida galinule lays a goodly clutch of eggs of from eight to thirteen, because both eggs and young are subject to many dangers. Here the mother is seen turning her eggs.

and instructive than a mere collection of eggs. Let the bird student take his camera into the field and secure a photograph of the eggs in their nest, their own proper setting. A well taken photograph will show not only the eggs, but the materials and position of the nest, which are as necessary to a correct understanding of a bird as are the eggs themselves.

ARIZONA PINE

In saintly service and seraphic praise
Before the face of God thy years are spent,
Thou priestly pine tree. Rich as sacrament
Thy shadows are unto the weary ways
Of man and bird and beast: the deep-toned lays
Of ocean from thy leafy strings unbent,
Beat to the fingers of the wind, and scent
Of prayerful incense round thy vesture plays.
Thou, royal pontiff of the wooded hills,
Outspread'st thy hands in benediction sweet
O'er all the tribes of restless woodland folk;
Thou shriv'st the squirrel, and the robin thrills
Thy leaves with hymns: all sylvan orphans fleet
For covert to thy sanctuaried cloak.

—M. J. Riordan.

GIVING MEDICINE TO TREES

BY DR. CAROLINE RUMBOLD

PATHOLOGIST, BUREAU OF PLANT INDUSTRY, UNITED STATES DEPARTMENT OF AGRICULTURE

CAN a tree be cured of a disease by giving it medicine internally? The usual method of combatting tree diseases is through the external application of sprays and fertilizers, or by cutting out and burning diseased parts or entire trees. Many parasitic fungi grow so deeply underneath the bark of a tree that any external treatment is ineffective. This is the case with chestnut blight, or the chestnut bark disease, as it is more properly called. When this fungus began to kill chestnut trees by the tens of thousands about fifteen years ago, it was not unusual for an owner of a prized ornamental chestnut to offer a reward of a thousand dollars to anyone who would save the tree. Numerous quack "tree doctors" advocated various alleged remedies which failed miserably when tested. Careful experiments by plant pathologists also failed to develop a successful method of saving a tree after it was attacked by the blight. The disease advanced ruthlessly and all who valued the chestnut trees were in despair.

In 1911, the State of Pennsylvania appointed a special commission to conduct scientific investigations to determine the cause of chestnut blight, and at the same time to immediately attack the epidemic by every means that seemed to afford any possibility of checking or delaying it. In connection with other lines of experimental work carried on by this commission, the writer was employed to investigate the possibility of controlling the disease by injecting chemical solutions into chestnut trees. In 1913, the Pennsylvania Chestnut Tree Blight Commission advised the Governor to discontinue its work because the blight had advanced too far into the State to make control practicable with the appropriation available at that time. During the next two years the writer continued the injection experiments under the direction of the Office of Investigation in Forest Pathology, Bureau of Plant Industry, United States Department of Agriculture. The University of Pennsylvania furnished laboratory facilities and many supplies. The credit for continuing these experiments to their present stage is due to Mr. Harold Pierce, formerly Secretary of the Pennsylvania Chestnut Tree Blight Commission, who generously financed the work.

METHOD OF INJECTING SMALL TREES

The chestnut trees in this orchard were infected with the chestnut blight, and it was desired to find if the fungus under the bark could not be killed by chemicals, without injury to the tree. As the tree absorbed the solution it was siphoned out of the jar through the tube.

The problem has been to find a chemical agent which would kill the fungus that causes the blight, when a solution was introduced into a tree. The first difficulty encountered was in getting the tree thoroughly injected with any kind of liquid. The sap of a tree does not circulate like the blood of an animal. The wood of a tree contains numerous vessels, or tube-like cells, through which the crude sap is conducted to the leaves to be manufactured into food which returns to the roots and other living parts through the inner bark. A substance in solution follows a vertical path up the tree through those vessels in the sap wood that are close to the place of injection. It can also descend through those vessels, but in all of this there is lacking that persistent passing and return of a stream, such as the blood stream, which constantly bathes the cells of the animal body. This path in the tree through which the injected solution passes, usually is but little wider than the hole through which it is injected. Besides this, the walls of the tubular cells act like blotting paper, with the result that the farther the solution passes from the point of injection, the weaker it becomes. So in order to inject a tree evenly on all sides, it is necessary to make a number of injections on different sides of the trunk, and even on the limbs. This means that many quarts of a very dilute chemical solution must be put into a tree if the chemical is to reach all portions of the tree. Were one to use only a small amount of concentrated solution,

INJECTING CURATIVE CHEMICAL SOLUTIONS

Another view of the apparatus used in injecting solutions into a tree. A glass jar containing the chemical solution was hung in the branches and connected by rubber tubing with a glass tube inserted in a small hole made through the bark of the trunk. This hole in the bark had to be made under cover of a liquid, otherwise air clogged the vessels of the wood and the solution would not be drawn into the tree. A clamp held the glass tube tightly against the tree.

it would kill the cells of the tree near the injection hole and would not reach other parts. This is one of the reasons why boring a hole in the trunk and filling it with strong chemical in either solid or liquid form is not likely to benefit a tree.

It was found to be essential to make the holes through the bark for injection purposes under cover of a liquid. If air enters before injection or with the solution, air-bubbles will clog the small tubes or vessels in the vascular bundles and prevent the solution's being absorbed by the tree. The reader will probably ask at this point if a tree whose trunk is peppered with injection holes is not seriously injured by such treatment. As a matter of fact, the trees with which the experiments were made did not suffer from this cause. The injections were made under sanitary conditions and only small holes were made. These were afterward filled with clean grafting wax, and a callus growth quickly closed up the wound, forcing out the wax plug. By the end of three years, there was not even a scar to show where the injection had been made.

The idea of introducing chemical substances into plants is more than two centuries old. The first report on tree injection for purposes of medication was published by a Russian scientist in 1894. This was followed by scattered work in America, France, Germany and Russia. Some successful results were reported, but in the main the effect of injected solutions were not beneficial or the results were inconclusive. The most practical method was contained in the Russian publications, and the Russion method of introducing solutions was used in the beginning of the chestnut experiments. Very soon however an easier and less expensive method was developed, in which the apparatus could be quickly adjusted to the trunk and left for twelve hours or more without further attention. On small trees, a glass container holding the solution to be injected was hung on a branch of the tree. The solution was led to the point of injection by a rubber tube in the end of which was a piece of small glass tubing which was inserted into the injection hole. The glass tube was held in place by means of a perforated rubber

CHESTNUT TREE IN WHICH LITHIUM CARBONATE HAS BEEN INJECTED

This shows the drying up of the chestnut blight canker. The dead bark was easily lifted out because the fungus was killed by the chemical.

cork, which in turn was pressed tightly against the tree trunk by a clamp, thus preventing leakage. This apparatus is shown in the accompanying illustration. A variation of this method was used on large trees. In place of the clamp, a link chain was placed around the trunk. It was tightened by turnbuckles and held the perforated rubber corks against the tree. The corks were protected from the metal chain by iron washers. A glass "T" tube, thrust through the cork, introduced the solution into the injection hole. The rubber tube leading from the reservoirs higher in the tree was attached to the vertical end

of the "T" tube. The free end of the horizontal arm of the "T" tube was tipped by a piece of rubber tubing; after the solution filled the tube, a tempered steel cutter was inserted through this horizontal arm of the "T" tube and driven through the bark of the tree. In this manner a small hole was made in such a way that no air could clog the vessels of the wood, and the solution to be injected began immediately to enter the tree. After the steel drill was removed, the free end of the rubber tubing was closed by a pinch cock. By this method any desired number of injections were made at one time. In these experiments, the hole cut for injection purposes was one-fourth inch in diameter and penetrated the wood to a depth of two annual rings.

It was found that all kinds of chemicals in solution could be introduced into the trunks, provided there was sufficient transpiration (evaporation of moisture) from

FURTHER ALONG IN THE OPERATION

This is the same canker as shown in the preceding illustration, with the dead bark removed, exposing the healed up edges of the blight canker. A year later this tree had thrown off the chemical and had become reinfected. However, this experiment indicates interesting possibilities for controlling tree diseases by injected chemicals.

the leaves to keep the sap moving. The transpiration was greatest in the case of chestnut trees when they were in full leaf and the day was sunshiny, dry, and a breeze was blowing. On cold, rainy days the trees took up very little of the injected solutions. The season of the year caused a great variation in the amount of solution absorbed by a tree, and also as to the part of the tree where the injected chemical went. For instance, if a lithium solution was injected in the autumn, when the nuts were ripening, a large amount of lithium collected in the fruits and in the ends of the fruiting branches. In the early

TREATMENT FOR LARGER TREES

A number of injections had to be made at one time in the larger trees, enabling the chemical solutions to reach all parts of the tree. This illustration shows three glass containers hung in a chestnut tree, and a chain clamp that was used to hold the tubes in the holes made through the bark. On a clear day in midsummer a tree of this size absorbed many quarts of solution.

spring, when the leaves were unfolding and growing, the lithium spread through the tree and less of the chemical reached the leaves. In Pennsylvania, June was the best month for injection so far as the rate of intake was concerned; then July, May, August, September, October and April. The rate of intake varied more in April, May and June than in the summer and autumn months. Solutions of organic compounds went into the trees more readily than solutions of inorganic compounds, and the "true solutions" more readily than the colloidal. The average amount of solution absorbed through a single injection hole by an orchard chestnut tree, 15 feet high and with a wide, rounded top, ranged from one-fourth pint per day in April to three-fifths pint per day in June. But there are records of three and nearly four quarts of solution passing through an injection hole one-fourth inch in diameter in 20 hours. Chemical solutions, with very few exceptions, were absorbed more readily than the pure water. Also, the more concentrated the solutions of chemicals, the more rapidly they were absorbed. In several cases, lithium injected into the trunk could be detected 10 hours later in the leaves of branches at the top of the tree.

Fifty-six organic and inorganic substances in solution were injected. The trees used in the experiments were orchard trees, for the most part Paragon scions grafted on native chestnut stock, but some trees growing under forest conditions were also injected. Most of the trees

were already infected with the chestnut bark disease. The cankers were outlined with paint at the time the chemicals were injected into the trees, so that an accurate record of the effect of the chemical on the fungus was obtained. The war interrupted this work before it had gone further than to show interesting indications. In the case of diseased chestnut trees injected in the spring and early summer months with dilute solutions of lithium carbonate and lithium hydroxide, the fungus causing the blight was checked in its growth and the trees started to form a callus at the edge of the canker. In some cases this callus growth resulted in so completely cutting off the diseased tissue from the rest of the tree that the diseased portion dried out and could be picked off like any other dead bark. However, the lithium was gradually eliminated from the tissues of such trees and they were then subject to reinfection by the disease. Thus, the success in controlling the blight has so far been only to find a temporary check.

The results of these experiments indicate that there is a large field for further research on the possibility of finding a cure by the injection method for chestnut blight and similar parasitic fungi that grow beneath the bark of trees. This work is preliminary only and has not solved the problem. It took many years of patient experiment to develop salvarsan, and this solved a problem as apparently hopeless as that of finding a practical remedy for the chestnut blight.

The subject is intensely interesting and will undoubtedly be further explored in the future. In the meantime, owners of chestnut and other valuable shade trees should know that itinerant "tree doctors," who claim wonderful curative powers for mysterious substances inserted into trees, are not likely to have been successful in achieving that which years of careful scientific research have failed to produce. This statement is not intended to reflect on trained men who are conducting legitimate tree surgery operations, but is directed against those "quacks" who prey on the ignorance of shade tree owners by selling worthless "remedies" at fabulous prices. Such persons not only get their money through fraudulent representations, but frequently cause death or serious injury to a valuable tree.

NEED OF FORESTS FOR WOOD PULP*

BY E. T. MEREDITH, SECRETARY OF AGRICULTURE

THE United States is today facing the most critical pulp and paper situations in its history. Of these the newsprint situation is the most serious. Present demands, abnormal though they may seem, are merely an incident in the rapidly growing normal demand for newsprint paper.

Today we are dependent upon other countries for the equivalent of two-thirds of the pulpwood, pulp, or newsprint which goes into American newspapers. Our newsprint industry is concentrated largely in New England, New York, and the Lake States. I am told that sixty per cent of the pulp and paper concerns in New York have no stumpage of their own, and that less than five have enough timberland for continuous future operation. The predicted life of the industry in New York, New Hampshire, and even in Maine, where the great bulk of our eastern pulpwood still remains, is alarmingly short.

We have on the other hand, large quantities of suitable newsprint woods in the Pacific Northwest and in Alaska. The annual growth of timber on the National Forests of southeastern Alaska alone would supply half of our present American newsprint requirements. Here the industry is undeveloped.

A far greater degree of independence in newsprint manufacture can be accomplished by two measures—the development of the industry in the Pacific Northwest and in Alaska, and the large-scale growing of timber in New England and the Lake States. Both of these measures would be greatly stimulated by the passage of the Poindexter Pulp Survey bill now pending in the Senate. A pulpwood survey would secure the facts on which a sound development of the industry in the Northwest and in Alaska could be based, and it would also afford a basis for the production of pulp timber in the Lake States and in the Northeast.

The American Pulp and Paper Association has urged the purchase by the Government of large areas suitable for the growing of pulpwoods. The Government has made a beginning in this direction during the past decade. In New Hampshire and Maine an area of about 362,000 acres has been acquired admirably adapted for this purpose. This area should be greatly enlarged to include much of the mountain region in New Hampshire, Maine and Vermont.

We already have some technical knowledge of the best methods for growing the pulp timbers of the Northeast and the Lake States, enough to begin intelligently; but a great deal of investigative work remains to be done. If the pulp industry of the Northeast is to be perpetuated in anything approximating its present size, the entire forest area of the region must be utilized to the limit of its productive capacity. This is hardly less true of the Lake States. Forest experiment stations alone will, in any reasonable time, furnish the required knowledge of the best methods of cutting, planting, production, and the various other steps in such intensive timber growing. Bills now pending in both Senate and House of Representatives provide for experiment stations on the White Mountain National Forests in New England and in Minnesota.

Protection of forests from fire is perhaps the most important single requirement in the growing of

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* *From a letter by Secretary E. T. Meredith, to the American Paper and Pulp Association.*

timber. Twenty-four States are receiving co-operation. These States expend yearly for fire protection upwards of $625,000, and private owners of forest land within their borders expend in normal years approximately a like amount. The Federal appropriation is but $100,000, which is entirely inadequate. This amount has remained unchanged since 1915, in spite of the fact that the number of co-operating States has increased from 18 to 24, and the cost of the work has practically doubled. The national policy of forestry advocated by the Forest Service contemplates a large extension of such co-operative fire protection. Not less than $500,000 is required to meet the needs of this situation adequately. Yet the present appropriation is but $100,000 and there is even danger of its being reduced.

The Forest Service is conducting at its Forest Products Laboratory work of very great and immediate importance to the pulp and paper manufacturer. Limited though such work is, it has already covered a large field in the suitability of various American woods for the different kinds of pulp, and incidentally has developed information of great importance on the technique of the various pulp-making processes. Along a limited number of other lines it has also been possible to make a beginning, as, for example, through co-operation, on the causes of and remedies for the molding and decay of pulp. The work already under way should be very materially expanded, and there is a wide range of other subjects on which intensive investigations would benefit both the public and the pulp and paper industry.

THE NEED FOR AN ARMY FOREST SERVICE

MANY perhaps believe that the great war which we have just been through revealed for the first time the necessity of an Army forest service charged with meeting the needs of the combatant units for wood. This is not true, says J. Demorlaine, a Frenchman interested in forestry, and he adds: "A chapter in the 'Exploitation des Bois' by Duhamel du Montceau proves the contrary, and is worth recalling today. One might believe that the passage was written yeesterday; yet it dates from 1764.

"Armies in the field," wrote Duhamel du Montceau, "in addition to their need for fuel, often have to construct entrenchments, to build barracks in the fall, or to conduct sieges or systematic attacks. For all these purposes considerable quantities of material are needed, which are naturally cut in the forests within easiest reach of the places where they are to be used. These expeditions are the ruin of the forests, especially when the cutting is done by regular troops, who seem to take pleasure in causing more damage than is necessary.

"The materials needed consist both of timber and of smaller products, such as twigs, withes, and pickets. These smaller products, after being brought from the forests, are made into various kinds of fascines, faggots, gabions, blinds, candle-holders, and litters.

"Often cuttings are made in those parts of the forests that are most accessible and most convenient to the roads and railroads, as a result of which the district is ruined, whereas if the choice were extended over the entire forest this might not be the case.

"Finally the fact that these supplies must nearly always be furnished under pressure during the exigencies of open war, causes the work to be done with a haste that is very apt to increase the disorder and to ruin the forests still further.

* * *

"The ordinary soldiers who are entrusted with securing these materials usually spread out in all directions, cut the coppice high in order not to inconvenience themselves, break off and damage more wood than they carry away, wound just for amusement all the trees that they meet, and commonly do the woods an injury which can be repaired only after a very long time.

"Whenever these contributions, which bear with particular severity on those districts in the theater of operations, can be supplied with any sort of economy, it would be wise of the commanding general, mindful of the fact that such devastation can profit no one and that it ruins the country for many years, to impose them systematically on the country and to send his troops for them only in case of absolute necessity.

"As for the damages done to our forests in securing war materials, a remedy could easily be supplied by having forest officers work with the Engineer Corps, since these know better than any one else how to conduct operations with a wise economy."

If the Inspector General of the Navy under Louis XVI were to return among us today, he would doubtless recognize with pleasure that his vision had been clear and that his ideas, 150 years later, had succeeded in justifying themselves. Consummate observer, forester in the best sense of the word, Duhamel du Montceau foresaw the indispensable organization of an Army Forest Service.

So this prophecy, inspired by the best of good sense, teaches and serves us. The role of the foresters in time of war has just been completely demonstrated.

The war of 1870-71 had perhaps confused people's ideas somewhat as to the mission that foresters would be called upon to fulfill in the field. The progress of modern war, which can only become still further accenuated, will render more and more necessary an autonomous Army Forest Service, with the same standing as the Engineer or Quartermaster Corps. This service should have its own life and its own military status in time of peace. It should direct the formation, management, instruction, and organization of the companies of mobilized foresters, or Forest Sappers.

This is the true solution of the problem of the conservation and at the same time the exploitation of the forests for the needs of war. "There is nothing new under the sun."

THE FALL WEB-WORM AND THE SWALLOWTAILS

BY DR. R. W. SHUFELDT, R. A. O. U.

(Photographs by the author)

INVESTIGATING the life histories of the larvæ or caterpillars of our moths and butterflies, the fact is soon discovered that the majority of them feed upon the leaves of a great variety of plants, shrubs, and trees. Where such defoliation does not affect man's interests, but little heed is given to it, except by the entomologists. Where the larvæ are small, more or less rare, and non-communal by habit, the effects on leafage is comparatively very slight. It may be slight, too, where the caterpillars are of the largest sort, not abundant, and a comparatively small number attack the foliage of any particular tree or plant. On the other hand, where the larvæ of any special moth mass in broods in certain trees, feed upon the foliage, or weave their common web so as to envelope leaves, and consume them, we have in such larvæ species that constitute a pest. The destruction that they do is not lost sight of until the following season, should the trees rally from the injury done and leaf out once more.

A good example of the first species referred to is seen in the caterpillars known as the forest tent caterpillars, the *Clisiocampa sylvatica* of Harris, which feeds on the leaves of different trees and shrubs, and is especially destructive in the case of the wild cherry trees. This species of larvæ construct a web in the fork of the tree where they were hatched out, and very soon commence to prey upon the leaves. The writer, in order to study their development, reared several hundred of these larvæ, feeding them on the leaves of the common wild cherry. It was amazing to note their rapid growth, the enlargement of their web, and above all the enormous number of leaves required to keep them fed. A limb with upwards of an hundred large cherry leaves upon it would be entirely consumed in the course of a couple of hours. These caterpillars grew rapidly, and spun a great number of small, white cocoons. From these presently emerged many beautiful little brown moths, with broad, dark, oblique bands on their upper wings. The pupæ from which these came were strong and of a deep mahogany brown color.

PART OF A BROOD OF FALL WEB-WORMS

Fig. 1. This brood was collected by the writer on a Red Mulberry tree (*Morus rubra*) in the rear of No. 1745 Park Road, N. W., Washington, D. C., early in June. These larvæ are in the early stages of their growth, and of varying sizes. Natural size; from life.

Such experiments are extremely interesting, and one of the most recent ones of this nature undertaken by the writer was a brood of the larvæ known as the Fall Web-worm, which formerly passed under the scientific name of *Hyphantria cunea* of Drury, but now called *H. textor* of Harris; its moth is also known as the Fall Web-moth.

Early in June, when passing through an alley in Washington, D. C., the writer noted, in some seven or eight places in a mulberry tree, that broods of a certain caterpillar had spun their webs about masses of leaves at the extremities of twigs, and were devouring them. These broods averaged several hundred—up to a thousand—in each community (Fig. 1). The owner of the tree inquired what ought to be done; she was advised to cut off the twigs bearing the webs and their occupants, and to dip each in a pail of boiling water. The expedient saved this splendid tree from complete defoliation during the next few weeks.

A large box with a tightly fitting cover of fine gauze wire made an admirable "breeding-cage" in which to place the reserve brood taken from the tree. Therein they were fed with the leaves of the mulberry tree and grape-vine until the early part of July, and it was

astounding to note the enormous amount of fodder they got away with in one night. As many as fifty grape-vine leaves were placed in their cage in the afternoon, in layers; the next morning only their stems and coarse veins or ribs remained.

As will be noted in Figure 1, these caterpillars are extremely hairy, and range in length from one to about three centimeters. They are a pale, yellowish green, with a darkish stripe down the middle of the back. On either side of this there is a longitudinal row of some ten minute dots. As these larvæ mature, the dorsal stripe gradually becomes almost black, and the animal grows much stronger. When very small they consume only the soft parts of the leaves, completely skeletonizing each leaf before leaving it. As they grow bigger and stronger, however, the entire leaf is consumed, and only the stem and stoutest ribs are left.

Changing the kind of leaf they were fed upon, produced no change in the color of the caterpillars, and their heads are always black. While the pattern remains very much the same in the adults, it does vary somewhat in color-shade, even in individuals of the same brood. The hairs are invariably light-colored, and each springs from a small, deep-yellowish-black wart at its base. Autumn specimens are darker than those composing a spring brood.

When these caterpillars get hungry, they swarm on the outside of their web; and on one occasion the writer had a small branch of a mulberry tree, carrying a large web with its owners, in his study. It was screwed into a small vise, which was attached to the top of a big tripod. There were some 250 of the caterpillars on the outside of the web. When the room was perfectly quiet, they all remained motionless; but should any one suddenly speak or clap the hands together, every one of the caterpillars would commence violently swinging the front half of its body, while the rear half remained still. This extraordinary procedure they performed in unison, sometimes keeping up the swinging for as long as fifteen or twenty seconds, depending upon the loudness and character of the noise that started them. Should the cause of the disturbance cease, the entire brood would stop their wagging motion at the same instant, and not one of them would move for several seconds. This is a very remarkable habit; the writer has never observed anything like it in any other species of caterpillar.

THE MOTH OF THE FALL WEB-WORM

Fig. 2. These are living and cabinet specimens of this moth (*Hyphantria textor*), with a pupa *in situ*. The living specimens are the ones with the wings closed, and the pupa is distinctly seen in its opened cocoon to the right. The males are the smallest specimens.

About the first week in July, the entire brood became very restless in their cage, and the smaller specimens readily escaped every night through the openings in the wire gauze. Between the 7th and the 14th of July, the full-grown individuals commenced to pupate, a few at a time, and they built their cocoons among the dead leaves at the bottom of the box. On or about the night of the 10th, however, there apparently arose in the full-grown specimens a common impulse to make their escape, and some two hundred of them, in some mysterious manner, squeezed themselves between the wire cover of the box and the edges of the box itself, escaping into the room. In the morning not a dozen of them were in sight, and not over twenty of them were left in the box. Neither were any of the pupæ visible; but that is not to be wondered at, as there were no end of places where the caterpillars could hide, the room being filled with all sorts of things usually found in a naturalist's workshop. There is but one large window in the room, facing west; so that on sunny days, when the shade is raised and the blinds thrown back, it is flooded with sunlight for hours. On bright moonlight nights, it may likewise be lit up in that way. Beautiful little pure white moths, few in number, began to make their appearance on the big pane of this window in the morning, the imagoes having made their emergence from the pupæ sometime during the night. This became the rule—in fact, there was a fresh crop of these moths on the window-panes every morning for the ensuing fortnight. They ranged in number from a dozen to thirty for every lot that appeared, all coming to the window during the night, and not being seen in any other part of the room. Over two hundred moths were thus taken during the entire time of emergence, and on the 28th of July only three moths came out—a male and two females.

With one exception, all these moths were pure white. The exception proved to be a male that had very minute black spots on the middle of either upper side of the front wings. The females are seen to be one-third larger than the males, and the very tiny green eggs they carried were distinctly visible through the thin skins of their abdomens. The males out-numbered the females about three to one, while their activity was no greater. In fact, after finding a resting-place, they all settled down as here shown in Figures 2 and 3, remaining so during

the entire time, taking to flight only when persistently disturbed. At night they were restless, especially on rainy nights, when they fluttered up and down the window-panes. By not gathering any on three consecutive evenings, on the morning of the fourth day there were no fewer than eighty-three of them on the window, a good proportion of which were females.

The eggs are very small, of a bright pale green color, and were deposited in patches. At their margins, these patches were irregular, the largest one covering an area of about a square inch. In a few cases a female would deposit a small patch of her eggs on the wings of another moth which had gotten beneath her. In about ten days, these layers, all sticking fast, were seen to change color, becoming a pale, whitish yellow. No attempt was made to encourage hatching.

In his "Field Book of Insects," Frank Lutz says: "The unsightly nests of the Fall Web-worm, made in late summer, are frequently confused with the spring tents of *Malacosoma americana*. The nest of *cunea* has a lighter texture, and covers all the leaves upon which the colony of larvæ are feeding; it occurs on more than a hundred different kinds of trees, apple and ash being among the favorites." *Fall* nests of the larvæ of this moth have never been seen by the present writer in the District of Columbia; but that may be due entirely to the fact that no special search has been made for them in this section of the country. Lutz points out and figures "the great varability which exists in the markings of both larvæ and adults."

TWO SKELETONIZED LEAVES OF THE RED MULBERRY

Fig. 3. These show the work of the smallest fall web-worms, with a number of the moths of this species on the sycamore leaves to the left. These moths are all from life, reduced one-third in size; the males are the smaller ones.

Of *"pallida"* of Packard he says: "The larvæ are social in their habits, and spin great webs upon the foliage of almost all kinds of deciduous trees in late summer and fall, and do a great deal of damage to orchards and nurseries. The insects pupate in loose cocoons, in crannies, and even under the loose surface of the soil. The species ranges over the United States from southern New England and New York to Texas and further west."

All the insects raised by the present writer had black antennæ and immaculate wings and bodies, barring the single specimen noted above. Perhaps the most formal account we have of the Fall Web-worm is the one that the late Professor C. V. Riley gave us in his brochure entitled, "Our Shade Trees and Their Insect Defoliators." Professor Packard reproduced this in full, including the cuts, in his "Insects Injurious to Forest and Shade Trees," which appeared in the Fifth Report of the United States Entomological Commission. This report is a very valuable one, and should be consulted by those interested in the protection of a great many of our trees, a list of 108 different kinds being presented, upon the leaves of which the Fall Web-worm feeds. In this list care has been taken to show the percentage of defoliation done by these larvæ in any particular species of tree.

Riley's report contains some very instructive illustrations. One gives the "Ravages of the Web-worm on poplars on one side of a Washington street, and exemption of maples on the other." Here we see, on Fourteenth Street, late in September, a row of large poplars stripped almost entirely of their leaves; and we have no reason to believe that such a calamity may not occur again. Indeed, the very larvæ described here may be some of an advance guard of the Fall Web-worm moth, which another season may be in Washington in millions.

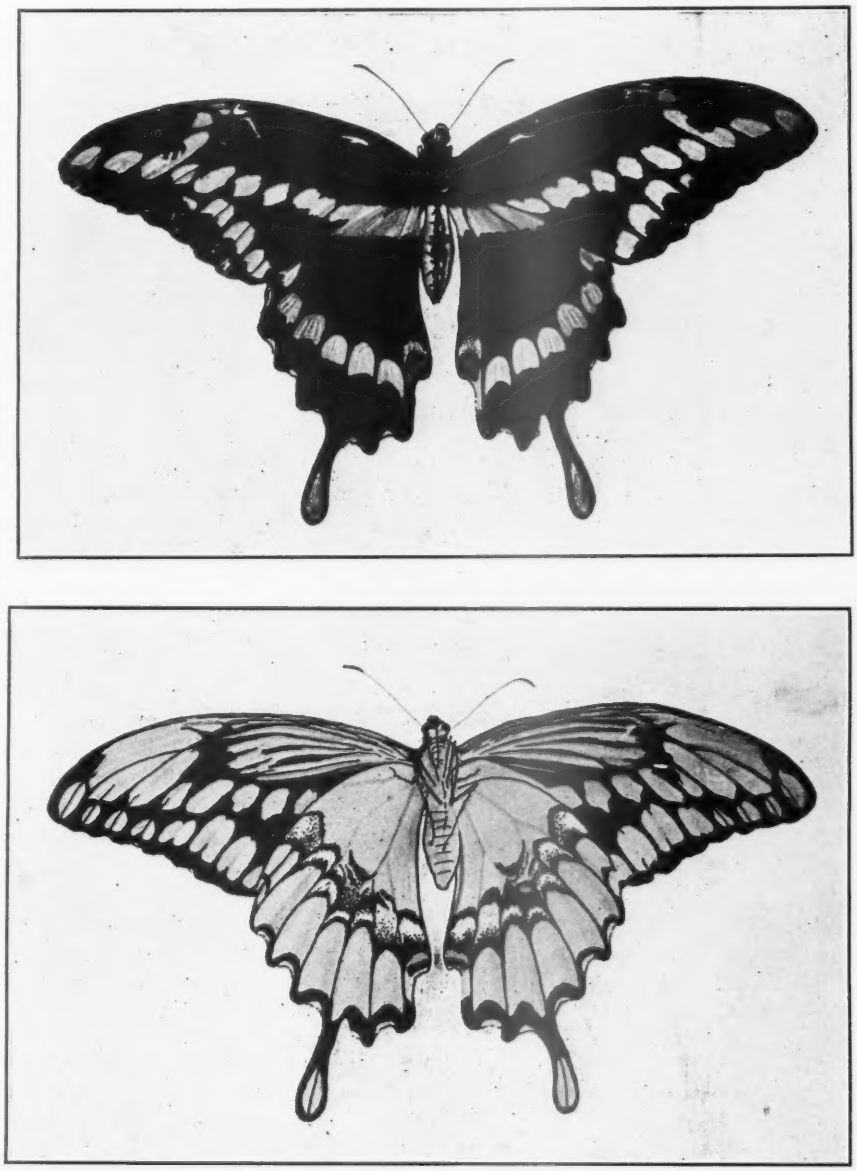
The smaller cuts in the body of Riley's account give a specimen of the Fall Web-worm moth in position on a leaf laying eggs, with nine of the eggs enlarged; then we have a dark larva of the moth seen from the side; a light larva from above, with two views of the pupæ and the upper view of a spread moth. Finally, there are ten cuts of wings from "a series of moths showing the variation from the pure white to one profusely dotted with black and brown."

It is further stated that "the caterpillars of this moth have quite a number of external enemies, which slay large numbers of them." Several cuts are presented illustrating these enemies, as one of the Rear-horse (*Mantis carolina*); the *Podisus spinosus;* also the pupa, larva, and egg of the latter; an egg parasite; the *Meterorus hyphantria,* with its cocoon—a sort of small, ichneumon-like insect, of which Riley says: "This insect has performed a very good service during the caterpillar plague, and has done much to check any further increase

of the Web-worm." A full account of its reproduction and modes of attack is given. Two other insect enemies are also illustrated and fully described—these are an Apanteles and a Tachina-fly.

These latter destroyed thousands of the Web-moth caterpillars during the plague of 1886, when the city of Washington and parts of its environs was overrun by them. "As long as the caterpillars were young and still small, the different communities remained under cover of their webs, and only offended the eye. But as soon as they reached maturity and commenced to scatter, prompted by a desire to find suitable places to spin their cocoons and transform to pupæ, matters became more unpleasant, and complaints were heard from all those who had to pass such infested trees. In many localities no one could walk without stepping upon caterpillars; they dropped upon everyone and everything; they entered flower and vegetable gardens, porches and verandas, and the house itself, and became, in fact, a general nuisance." It is said that along the tracks of the Baltimore and Potomac Railroad, the cottonwoods and white poplars were entirely stripped of their leaves for a distance of five miles out from the Capitol.

As stated, all the eggs laid by the moths reared by the writer were of a green color—a very light green. Each female deposited from four to five hundred of them, and in nature these are found either on the upper or under sides of a leaf selected to receive them. Riley's observations, however, led him to state that "the egg is of a bright golden yellow, quite globular, and ornamented by numerous regular pits, which give it, under a magnifying lens, the appearance of a beautiful golden thimble. As the eggs approach the time of hatching, this color disappears, and gives place to a dull, leaden hue." The writer also examined a large number of the eggs of this moth with a high-power microscope, and they looked like big, green, pitted billiard balls, placed in contact with each other, as far as physical tangency could be carried out, through the entire mass. Like all such structures, they are extremely beautiful objects when thus examined.



TWO VIEWS, NATURAL SIZE, OF THE GIANT SWALLOWTAIL

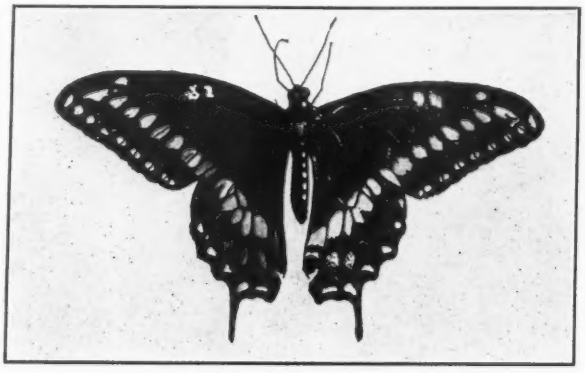
Fig. 4. This black and yellow butterfly (*Papilio cresphontes*, Cramer), is one of the largest in our fauna; it is very abundant in the orange orchards of Florida, where it is known as the "orange dog;" it is claimed that its caterpillar feeds on the leaves of those trees. The upper view as seen from above, and the lower view as seen from below.

Very few people see any beauty in a caterpillar—the larval stage of some elegant moth or other which every one admires. However, many caterpillars are extremely beautiful, not so much with respect to their forms as the wonderful coloration of some of the species. As to the harm they do to the leaves of many trees—it is but the nature of the creatures, and man is the only animal on earth that complains of their ravages. To read the accounts on the subject of our popular entomologists, one would think that all those species of

caterpillars given to defoliating shade trees in the city streets make their foraging invasions for the sole purpose of tormenting man, injuring him financially, and, in general, militating against his material interests. These writers seem to think that the parasites that prey upon these caterpillars are in the world as a mere factor of mitigation, and at work solely along those lines to eliminate, as far a psossible, all such insect forces as operate against these particular interests of man, into which latter category surely many caterpillars fall.

Our various casts of mind and the diversities of our sense of appreciation regarding such forms are truly remarkable. To some, the big, horned caterpillar of the Regal moth is a "horrible thing," from whatever angle it may be regarded; while to others it is an object of admiration, whether considering its extraordinary form and appendages, or its superb coloring, or the history of its more than wonderful metamorphosis. It is not difficult to conceive what the moths, the butterflies, their larvæ, and their parasitic and other enemies think of it; and were it possible for them to state their claims to their right to inhabit this planet, to live and reproduce their kind, they would surely convince any fair-minded jury as to their validity.

Many people will be glad to know that although larvæ or caterpillars of butterflies feed upon the leaves of many kinds of plants, shrubs, and trees, they rarely commit the wholesale damage that the caterpillars of moths do. Few groups of our United States butterflies are more widely known that those representing the genus *Papilio,* or as they are named in the vernacular, the Swallowtails. Most of the species are of good size, a large proportion of them being characterized by having a tail-like appendage springing from the inner third of the margin of either of the lower wings (Fig. 4). Indeed the wings of any of the five hundred or more distinct forms of this group vary greatly. Some even lack the tail-like appendage, while some foreign forms may have two or even three "tails" on either hinder wing. We have more than thirty different species in America, and new ones are constantly being added to the list.



OUR BEST KNOWN SWALLOWTAIL BUTTERFLY, AND SEEN FROM ABOVE. THE MALE OF THE COMMON EASTERN SWALLOWTAIL (*Papilio asterias*, Fabricius).

Fig. 5. The principal colors of these species are yellow and black; but the inferior wings have also a curved row of long azure markings, terminating at their lower inner angles in a conspicuous spot of yellow, black and red.

Our Giant Swallowtail (*Papilio cresphontes*) is found in Florida, and a superb example of it is here shown in Figure 4, having been captured by Mr. R. H. Young, of Haines City of that State, and transmitted by mail. The caterpillar feeds upon the leaves of the orange and grape-fruit trees, and the nurserymen have given it the name of "Orange Dog;" they claim that their trees suffer from its depredations. Its range is now being greatly extended, and this big butterfly has even been captured in Canada. Although its main colors are but two, black and bright yellow, it is a very conspicuous species wherever seen, and it forms a very striking addition to the cabinet. This Giant Swallowtail has a very close relative in the Thoas Swallowtail (*P. thoas*), a Mexican species, sometimes taken in the lowermost parts of Texas, especially in the hot, arid regions. This is also a black and yellow form; but the areas of the distribution of these colors are not quite the same as we find in *P. cresphontes.*

Our most abundant form of Swallowtail east of the Mississippi Valley is the familiar *Papilio asterias* (Fig. 5), a form famous throughout the Atlantic States southward to include the entire Gulf tier of States. The species is subject to considerable variation in size and in intensity of the markings. A very considerable aberration in which the yellow spots cover almost the entire outer half of the wings has been found on several occasions, and was named *Papilio calverleyi* by Grote.

Ever since the dawn of the biological sciences, the study of the world's fauna of moths and butterflies has occupied the minds and time of thousands of earnest students. We now have a superb literature upon the various fields of research covered, carrying an enormous body of illustrations of every conceivable description. Apart from the study of fossil forms, we have to deal with the collecting and breeding of every specific and subspecific form of butterfly and moth in the world, and there are a great many thousands of them. To some extent, these have already been dealt with; but where they have not, the species must be examined superficially and structurally, described, and figured. We must also make record of the reproduction of any particular species, as its eggs, larva, pupation, and so on, together with an intimate investigation of its habits in nature. Then we have the matter of geographical distribution to deal with; variation of species; the preparing of specimens for the cabinet, and for study in schools and museums; modes of capture, and some eight or ten other lines of investigation and research.

In previous numbers of AMERICAN FORESTRY it has been pointed out how important a number of these fields of inquiry are to those interested in the protection, propagation, and study of our forests and shade trees, and the subject is one that will bear a considerable amount of elaboration. All this goes without the saying; but upon the other hand hardly a word has been said

with respect to how, when, and where to collect the larvæ of our moths and butterflies, their pupæ, or the insects themselves. Such work demands a sufficient knowledge of entomological literature to enable the student to identify species and subspecies when they come to hand; their various methods of breeding them successfully in captivity, and their collecting in nature and subsequent preservation.

When properly preserved in modern cabinets, moths and butterflies form one of the most beautiful and instructive series of objects that can be imagined; while the collecting of such material in their various haunts has so much to be heartily recommended in it, that not a few books have been wholly devoted to it by students of every civilized nation in the world. Even some of our commonest butterflies, such as are here shown in Figure 5—were it possible to present them in their natural colors—are, when perfect, of surpassing beauty.

Aside from the moth and butterfly collecting as a lucrative enterprise, in various parts of the world, it possesses the advantage to the individual of open air exercise; the cultivation of the spirit of travel; the development of the power of correct observation; the training of all the special senses; the formation of the habit of literary research and review of museum and private collections; the making of agreeable and desirable acquaintances and friends, with various other advantages thrown in.

Many years ago, the late Alfred Russel Wallace, the co-investigator in the field of organic evolution with Darwin, was a correspondent of the writer's after his return from England from his famous sojourn of eight years in the wilds of the islands of Malay Archipelago. Subsequent to his return in 1862, Wallace published one of the most interesting books of travel that ever came off the presses. He was a most enthusiastic collector of all sorts of living forms in the field, especially so with respect to the gorgeous specimens of moths and butterflies that occurred in the fauna of those great islands that he explored in the eastern seas. That book appeared in 1869, since which time the writer has read it through three times from cover to cover.

While in Sumatra, Wallace collected some remarkable species of *Papilio,* of which he presents several figures in his book. They have the same general form as the butterflies of this genus considered in the present article, while upon the other hand they show some very curious differences. The observations were made at Lobo Ramau, a central point at the east end of Sumatra. He says that "during a month's collecting, I added only three or four new species to my list of birds, although I obtained very fine specimens of many which were rare and interesting. In butterflies I was rather more successful, obtaining several fine species quite new to me, and a considerable number of very rare and beautiful insects. I will give here some account of two species of butterflies, which, though very common in collections, present us with peculiarities of the highest interest.

"The first is the handsome *Papilio memnon,* a splendid butterfly of a deep-black color, dotted over with lines and groups of scales of a clear ashy blue. Its wings are five inches in expanse, and the hind wings are rounded, with scalloped edges. This applies to the males; but the females are very different, and vary so much that they were once supposed to form several distinct species. They may be divided into two groups—those which resemble the male in shape, and those which differ entirely from him in the outline of the wings. The first vary much in color, being often nearly white, with dusky yellow and red markings; but such differences often occur in butterflies. The second group are much more extraordinary, and would never be supposed to be the same insect, since the hind wings are lengthened out into large spoon-shaped tails, no rudiment of which is ever to be perceived in the males or in the ordinary form of females.

"These tailed females are never of the dark and blue-glossed tints which prevail in the male, and often occur in the female of the same form, but are invariably ornamented with stripes and patches of white or buff, occupying the larger part of the surface of the hind wings. This peculiarity of coloring led me to discover that this extraordinary female closely resembles (when flying) another butterfly of the same genus, but of a different group (*Papilio coon*); and that we have here a case of mimicry similar to those so well illustrated and explained by Mr. Bates. That the resemblance is not accidental is sufficiently proved by the fact that in the north of India, where *Papilio coon* is replaced by an allied form (*Papilio Doubledayi*) having red spots in place of yellow, a closely allied species or variety of *Papilio memnon* (*P. androgeus*), has the tailed female also red-spotted. The use and reason of this resemblance appears to be that the butterflies imitated belong to a section of the genus *Papilio* which, from some other cause or other, are not attacked by birds, and by so closely resembling these in form and color the female of memnon and its ally also escape persecution. Two other species of this same section (*Papilio antiflurs* and *Papilio polyphontes*) are so closely imitated by two female forms of *Papilio theseus* (which come in the same section with memnon) that they completely deceived the Dutch entomologist, De Haan, and he accordingly classed them as the same species.

"But the most curious fact connected with these distinct forms is that they are both the offspring of either form. A single brood of larvæ were bred in Java by a Dutch entomologist, and produced males as well as tailless females; and there is every reason to believe that this is always the case, and the forms intermediate in characters never occur."

This rather full quotation from Wallace sees its justification in the fact that it is so pregnant with useful lessons in entomology in general and the study of moths and butterflies in particular. Our own forms in these groups have, to be sure, been extensively written up; but then, be it known, there still remains a whole lot in the lives of many of them of which we have not, at this writing, a single line of information.

GRANDSIRE LOON'S MISTAKE

BY FRANCES H. UPTON

MR. and Mrs. Louis Loon had a summer home on a big lake away up in New Hampshire. They usually went there in May and stayed until the lake froze over. After the ice came they could not get any more fish so they went back to the seashore for the winter. Of course, you know the sea does not freeze over except around the edges and so the Loon family could get plenty of food there even in cold weather. But they liked best their own lonely northern lake and spent just as much time there as they could. Mr. Loon's family had been going there for years and years. Old Grandsire Loon had considered it quite the choicest spot for a summer home.

"YOU know," he remarked to Grandmarm Loon, shaking his coal black old head (for loons do not turn grey the way we human beings do), "I roamed about a bit in my young days—all over Canada and Hudson Bay—and I never found a place so well suited to our family as this is." "Yes," Grandmarm agreed, "it is just the place for the children—the swimming and the fishing are good and the water is cold." "Our family has always had a fondness for cold water," she added, and her collar of snow white feathers ruffled with pride. "The best thing of all," said Grandsire, "is, that there are none of those horrid, bold human beings about, and I really believe they haven't discovered our lake at all, thank goodness."

YOU see Grandsire Loon had once met a bold bad hunter with a gun, and if he had not dived and swam under water as quick as a wink, the bullet from that gun would have killed him. Now, he thought that all human beings were alike, and here is where he made a great mistake, as you shall see, if you have patience.

YOUNG Mr. and Mrs. Louis Loon were a very smart young pair. Every year they raised two children, and sometimes three. Early in June, Mrs. Loon went to her favorite nesting spot on the sandy side of Big Island, and there she and Louis made their nest. You would think it was the oddest looking nest you ever saw. Right near the waters edge Mrs. Loon scratched a hollow place in the sand with her queer, webbed feet. Meanwhile, Louis waddled around and picked up sticks with his sharp green bill. "Those are fine, Louis, and you have enough now," called Mrs. Loon to her husband, as she poked the sticks into place with her bill. "All right, Louisa," answered Mr. Loon, "and now for some of those nice cattails over yonder."

THEN they each took the head of a cattail and pecked and pulled away at it until it looked and felt like soft feathers. This was the lining for the nest. Some birds would laugh at the idea of calling that hole in the sand a nest, but Mr. and Mrs. Loon do the best they can. You see they are very clever about flying and swimming, but they can't walk a bit well, and so they make their nest as near the water as possible.

AS soon as the nest was done, Mr. Loon got into the water with a shrill cry of relief to think that job was done. "Try it, Louisa," he shrieked, "I do hope it's comfortable, my dear." Mrs. Loon settled herself in her nest and gave a laugh. "It's the best one we ever built," she trilled contentedly. In a few days, if you had looked into that nest, you would have seen two greenish brown eggs, spotted with dark brown. They were bigger than hen's eggs, and Mrs. Louisa Loon was very proud of them. One day, saucy young Sammy Snake discovered them. He was just going to have a nice meal when Mrs. Loon returned from her morning exercise. Oh, didn't she scream and scold! Young Sammy only winked at her and said, "Well, madam, I don't think they're pretty eggs, anyhow, such a horrid brown color. I'm sure I don't want them." "Horrid brown color, indeed," said Mrs. Loon, "just you wait until next week and see what you'll see!"

ONE fine day soon after this, Sammy heard a great screeching and calling, so he hurried to the waters edge to see what all the excitement was about. There he saw Mr. and Mrs. Loon giving two baby loons their first swimming lesson. Such a commotion! But how quickly those Loon children learned to swim! Soon they were off for a trip up the lake, father and mother swimming on the outside, and the two young ones swimming between them where they were safe from harm.

"NOW, Millie and Willie," said old Grandsire Loon to his two grandchildren one day, "I am going to tell you something very important." "Yes, sir," said Millie and Willie very respectfully. "Now, my dears," continued Grandsire, "if you ever see any human beings around this lake there are two things you must remember to do. First, call to me as loudly as ever you can. Second, dive and swim under water until you are as far away as Little Island is from Big Island."

"BUT, Granddaddy, how are we to know what they are when we see them?" asked Willie and Millie in chorus. "Well, my chicks," replied Grandsire, "it's easy enough. There's nothing else like them. They walk on two legs and they have two queer things called 'arms' instead of wings, which hang at their sides. The poor creatures can neither fly nor swim." "Then, how can

they harm us, Granddaddy," asked the two young loons. "Because they carry things called 'guns.' These look like nothing but a stick of wood. But the things make a frightful noise and a cloud of smoke. If you don't get out of sight quickly, a small round ball will hit you. It hurts too, and sometimes it kills." "Oh, dear," said Millie and Willie, "we'll surely be careful Grandsire."

NOW, one pleasant day in July, Millie and Willie were having a race to Hemlock Point. They were each so very much interested in trying to win that they forgot all about their grandfather's advice. "I'm lots ahead of you," called Willie, "my feet are touching the sand.. Oh, dear, what a queer looking bird. Come here, Millie." And there, not far away was the strangest looking object they had ever seen. It was swimming near and nearer.

THE NEST OF A LOON

"LOOK," said Willie, "it has yellow down on its head and blue eyes and a funny flat red bill—oh, Millie, what a strange bird." "Be quiet," whispered Millie, "you don't want to scare him away. He may be a good play-mate for us." Just then the stranger caught sight of them. He turned around and swam away just as fast as he could. But Willie swam after him and called "Please come back and play with us—oh please do." And the strange creature turned around and swam back with Willie to where Millie was.

SOON they were friends and were racing to Big Island and back. The young Loons were the faster swimmers and the better divers, but they couldn't float on their backs the way the stranger could. They had such a jolly time together. After a while, Millie thought of something. "What is your name?" she asked shyly. "Bennie," replied the stranger, "and I live in that tent up there on Clover Hill. All of us Boy Scouts are camping out here for a whole month." "Do you fly 'way up there every night?" asked Willie. "Fly?" said Bennie, "Well, well, do you thing I'm an airplane or a bird? I can't fly." "Oh you poor thing," cried the little Loons, and they looked as if they were really sorry for their new friend. "But, of course, you'll learn to fly sometime," said Willie very politely, "it took Millie and me days and days to learn to fly over Blacktop yonder.

BUT Bennie only shook his head and two big tears started down his cheeks. "I can't ever learn to fly," he said, "because I haven't anything to use for wings." At this, Millie and Willie both began to cry for they felt so sorry for their friend. Altogether, they were very gloomy and unhappy for a few minutes. But very soon, indeed, Bennie grew tired of feeling sorry for himself. You see, he really was a cheerful little boy and was usually quite ready to make the best of a bad bargain.

"ANYWAY, I don't care," he said with a grin that showed all his white teeth, "I can run faster than any other Scout in the Troop." "O-O-Oh!" wailed the little Loons, and they both cried harder than ever. "What ever is the trouble now?" said Bennie, quite out of patience. "Please stop crying. I don't care, really, because I can't fly." "Boo-hoo-hoo," wept the little ones, "we can't run at all; we can only waddle, oh, boo-hoo-hoo."

AND then Bennie felt so sorry for them that he cried some more too. But in a minute he thought of something which made him feel more cheerful. "Why look here," he said, "we can help each other. I've thought of a wonderful plan. Some day we'll take a long trip—just the three of us. You two can fly and carry me until you are tired, and then I can run and carry you. Oho! what fun." "Yes, yes," said Millie and Willie, "let's go to Silver Lake and spend the day with Uncle Larry—do let's go soon—oho! what fun!" and they quite forgot to cry.

AFTER this these three had many good times together, but one day Willie happened to think of something. "Bennie," he said, "what kind of a bird are you, anyway?" At this Bennie laughed and laughed and laughed. Finally he stopped laughing enough to say, "I'm not a bird at all, Willie. I'm a human being." "But you can't be," piped up little Millie, "because you don't carry a gun." "Ho-ho-ho," laughed Bennie, "that's because I'm a Boy Scout—we don't go around killing things." "Well, well," said Willie, "that's the first mistake I ever knew Grandsire to make. Oh! what a joke on him." "Tee-hee-hee," giggled Millie, "do let's go and tell him right away. You come too, Bennie, so we can show Grandsire how nice some human beings are."

SO off they swam to find old Grandsire Loon and tell him the joke.

"WE MUST CHOOSE

AS AN example of the co-operation of the newspapers with the American Forestry Association in campaigning for a national forest policy the *Minneapolis Tribune* is entitled to a place in the front rank. The *Tribune* devoted a big editorial to the newsprint situation and on the same page printed the article by R. S. Kellogg, secretary of the Newsprint Service Bureau. Mr. Rome G. Brown then sent the page to every Associated Press newspaper in the United States. The article sent out by the Association on the forest situation in this country has been reprinted by many newspapers and much editorial comment based upon the figures. In an editorial the *Rochester Democrat and Chronicle* warns the country as to the need of a national forest policy, and recounts the work the Association is doing. The editorial concludes:

"Will America heed the message and carry on the work begun? Upon the answer to that question depends more than can be appreciated now. The nation which allows its forests to perish will itself fall into decay and be in danger of perishing. France was saved by her forests. The loss of her forests doomed China. Which of the two nations do we propose to emulate? Which fate do we choose, for we must choose?"

The editors of the country have taken up the work of the American Forestry Association in a whole-hearted manner from every side, the planting of memorial trees, "Roads of Remembrance" and a national forest policy. Indeed many of them point to the tree planting as the greatest opportunity for educating the individual to the bigger aspects of the situation. Some of the comment follows:

Binghamton Sun: A worthy campaign for planting of trees is being carried on by the American Forestry Association. The Association is appealing to motorists to help by planting memorial trees along the highways to beautify the roads. An appeal is also being made to school officials throughout the country to interest the school children in the project. The work of the Association deserves hearty support of every true American. Not only will the planting of trees make the country more beautiful, but it will add materially to the corporate wealth. The serious depletion of our forest preserves is an important factor in the present shortage of paper. By teaching the younger generation to love trees and appreciate their value, an educational work will be done that will ultimately result in an improved national forest policy, something that is badly needed. Now is a good time to start the work, and thereby add to the beauty of the city, and help the good work that the American Forestry Association is doing.

PLANT TREES

Joyce Kilmer wrote:

"Poems are made by fools like me,
But only God can make a tree."

That only Eternal Wisdom can create the seed from which the tree grows is true. Eternal Wisdom also creates the other seed grown in the brain that creates the poem.

"Only God can make a tree," but a man, or even a child, can PLANT it and have the satisfaction of leaving upon the earth proof of his existence.

Plant a few trees yourself this year if you live away from asphalt streets, encourage each child to plant one.

The Christian Endeavorers have promised to plant trees on all occasions. The American Forestry Association, of No. 1410 H street, N. W., Washington, D. C., will send information as to just how to plant a tree.

Plant a tree in honor of those you like and respect, living or dead. Plant a tree for the soldiers and sailors that lie under the ground. . .

Plant trees for yourself, for the benefit of those that are to come after you on earth. No man need leave the earth bare of all proof that he ever existed, for a few good trees planted now will be giving fruit, or shade, or both, years after you are gone.

The dweller in the city will ask, "How shall I plant a tree?. Would it grow in the backyard, that the sun never visits, or will it sprout through the asphalt, the cobblestones or the sidewalks?"

No, unfortunately, city dwellers cannot be tree planters, IN THE CITIES.

But all the more reason to help make the country more beautiful. Nearly everybody goes to the country, nearly everybody CAN GO.

Go and take your tree with you, find the place by the roadside, or on a high hill. Plant it and leave; go to see it next year. If you cannot be a tree owner, be a tree creator.—*New York Journal.*

Houston Post: The suggestion of Charles Lathrop Pack of the American Forestry Association that the Bankhead Highway be made a "Road of Remembrance," in honor of the late Senator John H. Bankhead of Alabama, is most appropriate, and is worthy of serious consideration by the Bankhead Highway Association. In these sections, in particular, the suggestion of Mr. Pack that memorial trees be planted along the road by the people should be received with cordiality, for the trees would add to the beauty of the route and serve the practical purpose of providing needed shade, as well as inspire all who travel the road with gratitude for its founders.

Denver News: In response to a senatorial request for information in regard to the depletion of the forests, the American Forestry Association has presented figures to show that the New England States are no longer self-supporting in a lumber way; that the Lake States, once the greatest producers of lumber, are now importing lumber to keep alive the many wood using industries in that section; that the center of the lumber industry is fast moving to the Pacific Coast, which means long hauls and high freight rates; that the lumber people of the South say they will be through in fifteen or twenty years, so far as yellow pine is concerned.

Americans in France were much impressed by the destruction by the Germans of great national forests that had been protected by the French Government for hundreds of years, no cutting being allowed except under official auspices. The loss was so needless and so irrevocable that apart from the destruction of life it figured with observers from this side as one of the most lamentable features of the war. But the American Forestry Association shows that the forest fire loss in this country each year is about $28,000,000 and the area burned over is ten times greater every year than the devastated areas of France, yet when such fires are reported in the news columns as they occur, they create only the most passing interest. The Association would like greater protection for even private forests in order to prevent denudation of regions fit only for the growing of forest trees; hundreds of thousands of acres have been stripped of their growth, it is said, and left useless. Under protection trees are cut under official supervision only and no land is cleared.

It is time that all land owners should give heed to this rapid disappearance of forest trees and do their part, if it is only a little, to offset the scarcity. Few farms but have some corners, hills or ravines or other untillable ground, where trees might be the only crop. It is the selfish argument with some that the planter of a forest tree

FORESTS OR DEVASTATION"

does not live long enough to benefit by it.

This is not strictly true, but if it were, every man should be glad to do something for the next generation and perhaps he could do no better than to plant trees.

Baltimore Star: For economic reasons the American Forestry Association is endeavoring to arouse public sentiment in the interest of a national forest policy which it believes to be imperative at this time. The raw materials essential to a large share of industries come from our native forests, and figures cited by the AMERICAN FORESTRY Magazine indicate that 52,000 establishments engaged in manufacturing are depending solely or in part on the products of the forests for raw materials used in their varied lines of manufacture. The magnitude of the figures cited in the periodical to which we refer makes their acceptance a matter of difficulty. It behooves us to realize, however, that in spite of the propaganda which would convince us that trees are being planted in every section of the country, the fact remains that old forests are being destroyed very much more rapidly than new ones are planted. America is the only country which does not give legislative protection to her forests, and the result is wanton deforestation in many sections of the country. The scarcity and expensiveness of newsprint alone are facts palpable enough to convince us of the need for a national forestry policy. The life of a tree is a matter of no small moment and it will be a fortunate day for America when her citizens awaken to this fact.

Brattleboro Reformer: In its gift of trees to Europe the American Forestry Association could not bestow a finer gift for use in those ravaged countries than the sugar maple. Its autumn coloring is world famous, its leaves a great fertilizer and its wood is probably used in utilitarian products more than any other. The more maples included in the gift the better.

Little Rock Democrat: Acuteness of the present newsprint paper situation in this country is emphasizing more strongly than ever the necessity for a broad policy of national reforestation, particularly in the case of pulp wood lands. The present shortage of paper, its unprecedented cost and the prospect, within a comparatively few years, of an actual failure of supply, has awakened the nation, as nothing has ever done, to the truth of the propaganda started years ago by the American Forestry Association of Washington, D. C. Clearly it is up to the Congress to outline and provide a comprehensive plan for the United States Forest Service, through which the future supply of lumber and paper in this country may be assured.

Berkeley Gazette: A Hall of Fame for trees is being compiled by the American Forestry Association. In it are to be enrolled all the great trees from east to west, from north to south, around which and in whose shade American history has been centered. The people of this country, sprung so lately from pioneers, should delight in this Blue Book of Trees. It should prove not only vaulable and interesting from an historical point of view, but should stimulate in the hearts of its readers, a greater love and reverence for trees themselves.

"AN' PEEPUL USTER THINK I WUZ BAD!"

Patton, in the Dallas Journal.

Successful Farming: The American Forestry Association is doing a good work in popularizing memorial trees along our highways in remembrance of our fallen heroes. Nothing was so impressive to the Yanks as the splendid tree-lined highways of France. They were properly set and properly cared for. Their shade was a benefaction to the traveler and also a great benefit to the highways, keeping them from being too wet and too dry.

If the practice should prevail in this country it should begin as soon as a highway becomes permanently established and graded. Only those trees should be planted which the foresters know to be suitable for each stretch of road. It is evident that a road that goes through low, wet places and over high hills will require different kinds of trees if permanency is desired. These trees should be under the care of the State forestry department. What can be more suitable than splendid, shady highways as a memorial to our boys who fell?

Savannah News: There is a fine significance in the news from Washington that the president of the American Forestry Association has suggested that along the proposed Bankhead Highway, which has been for some time a reality, stretching from Washington City to San Francisco, be planted memorial trees—that continent-long stretch of living, growing attractive trees to be the monument to the last member of the Confederate army to sit in the upper House of the Congress of the United States. Trees lining notable highways have a beautiful sentiment attached to them and the practical values will be increasing as the living monuments stand and grow and by example occasion more systematic reforestation in many sections of the country.

Detroit News: Emulation in memorial tree planting is fostered by the American Forestry Association, which has a plan to register on a national honor roll the names of all trees planted as monuments. For local beautification and as a patriotic incentive such a scheme is wholly to be commended, and its carrying out on a more pretentious scale might achieve really practical results in forestry. There are names in American history more fittingly commemorated by a forest than by a tree. Nor can it longer be objected that forests must be remote and unvisited. Automobile tourists are counted upon as a reliable source of profit for most out-of-the-way places, and their revenues might easily suffice for the maintenance of forests if thought were given to making scenic regions accessible. How much better that the thousands who annually tour through the upper parts of Michigan should be inspired by the majesty of stately forests than depressed by the continuous sight of wreckage which the greed of men left as the sole memorial of the State's former natural wealth.

New Bedford Standard: Tree-planting is in the air in Massachusetts. It is almost a case of everybody's doing it. A householder need not be shy of starting the movement in his block or his street. It will be good public service.

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TREES TO BEAUTIFY DALLAS, TEXAS

A DEFINITE movement for the beautification of Dallas, Texas, through the planting of trees, shrubs and flowers has been instituted by the Tree, Shrub and Flower Planting Committee of the Metropolitan Development Association of that city. The remarkable opportunities which present themselves to property owners for the beautification of their streets and the enhancement of property values have been stressed at meetings of this committee. It is expected that the movement will become city-wide, and that within a short time property owners will be joining with each other in a systematic effort to increase the attractiveness of their particular sections of the city.

How quick results may be obtained, with a small expenditure of money, have been repeatedly stressed by Alfred MacDonald, city forester, who has announced that one of the 1920 aims of the City Forestry Department will be the creation of a municipal nursery where trees can be grown, to be transplanted later to the streets of the city.

"In order to insure better tree planting in Dallas," says Mr. MacDonald, "the City Forestry Department is arranging for the planting of shade trees at cost for property owners who desire them. When the Forestry Department plants such trees we give them special care, without further expense to the property owners, for a period of two years. The cost of such work is $2.50 for each tree planted. The department prunes, trims and cuts all trees in the parking spaces and within the limits of the highway without expense to the owner of the property.

"Trees growing naturally in the forest are protected from winds and storms by other trees; they are protected from insect attacks by birds and natural enemies of insects. But trees on a city street have none of this protection. Their roots suffer from lack of moisture which cannot penetrate the hard pavements surrounding their trunks. Insects feed upon them without interruption, and trees on a city street are at the mercy of the elements. So it is that of probably more than 200 kinds of trees which grow in this section only a comparatively few are adapted to planting in a city.

"Among the best trees for street planting are American elm, sycamore, hackberry, black locust, honey locust and pin oak.

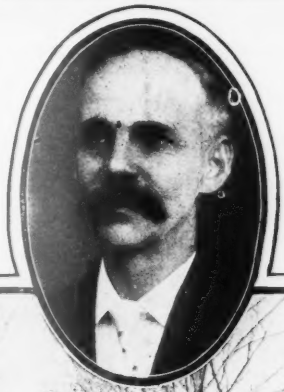
"Cottonwood, box elder and ash should not be planted in Dallas, and especially should not be planted on a city street because of their susceptibility to insect attack.

"There are probably 30,000 trees on the streets of Dallas and there should be 150,000. Ten thousand trees a year should be planted in the city. If intelligent tree planting can be promoted, and if we can have sufficient funds to give the shade trees the care they need, we can in a few years make the street of Dallas cool, leafy tunnels arched by living walls."

ANESTHETICS FOR TREES

THE theory that trees should be treated with anesthetics to enable them to withstand the shock of transplanting has been advanced by Sir Jagadish Chandra Bose, an Indian scientist, says an Associated Press dispatch from London. Sir Jagadish showed photographs of large trees which he had successfully transplanted in Calcutta in spite of their age. Realizing, he explained, that the difficulty of successful transplantation lay in the shock of removal, and that nerve effects in plants and animals were on similar lines, he treated these trees with anesthetics and they bore the uprooting and removal well.

The tribute of William Turner to Davey Tree Surgery



View of Bertram H. Borden estate, The Riverlands, Oceanic, N.J. William Turner is superintendent of this estate

The Riverlands, Oceanic, N. J.

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CANADIAN DEPARTMENT

BY ELLWOOD WILSON

PRESIDENT CANADIAN SOCIETY OF FOREST ENGINEERS

THE Department of Lands and Forests of the Province of Quebec has decided to withdraw the permission heretofore accorded to cut "black spruce" under twelve inches, the legal limit for white spruce, cedar, maple and jack pine. Red spruce is included under the head of black spruce or white spruce according as it grows on swampy land or on high land, or according to the view of the inspector. The two species are so much alike that it is very difficult to tell the difference. The regulations will be more rigidly enforced in the future. In referring to diameters, for the purpose of the regulations the diameter is at a point "two feet from the soil." In the past a certain number of trees cut under size have been charged for at the rate of two dollars per tree, but as the lumbering operations have pushed farther north into smaller timber, so much has been cut under size that the Department has decided to enforce the regulations and has made an inspection during the past summer which showed so many violations that they decided to charge in fines at the rate of one dollar per tree. At this rate the fines in the St. Maurice Valley already amount to $50,000, with more to come. On some areas examined, if the regulations had been followed, only four trees per acre would have been cut, an impossibility for profitable logging. If the regulations are enforced and the undersized material is not worth the amount of the fines, the result will be a decided curtailment of the cut which will be quite a hardship to some operators and a constant source of irritation for them and trouble for the Government. The Department says, however, that if applications to log on particular areas are received in the spring, it will inspect the territories and if it seems wise to allow undersized cutting, from a silvicultural standpoint, they will give permission. This would certainly be a good thing for the forests if carefully carried out, but the Government has not a large enough staff to supervise this work, and it opens up opportunities for dishonest operators to bribe Government inspectors, which are not pleasant to contemplate. In the past, when most of the cutting was done on contract, operators had trouble with scalers who were bribed by the contractors to make false returns, and it is certainly wiser to prevent opportunities of this kind, wherever possible. The only feasible way is for the Government and the operators to employ technical men in their inspections and in charge of their woods operations. License holders should make out cutting plans for a few years in advance, these should be approved by the Government and the operators should be required to have experienced technical men to carry out the work, who should be held strictly accountable for fulfilling the requirements of the plans. The pulp and paper industry has grown to such an extent and is such a source of revenue to the Province that everything possible should be done to foster it and to PUT IT ON A PERMANENT BASIS. If mills are permitted to work against their own best interests and to use up all their raw materials in a comparatively few years, their closing down would be a great calamity, even though they had paid back their investors many times over. Keeping them going is vital to the prosperity of the country.

The Technical Section of the Canadian Pulp and Paper Association will be the guest of the Spanish River Pulp and Paper Company at Sault St. Marie during the week of June 21. The mills of the company will be visited and also several plants of the neighborhood.

The various companies in the Association have agreed to take into their mills during the summer 63 students who are interested in studies connected with the pulp and paper industry.

The Council of the Technical Section has passed a resolution recommending that the Association take over the Dominion Government Forest Products Laboratory, established some years ago at McGill University in Montreal, and operate it for the investigation of fundamental problems of interest to the industry and for a general bureau of information. The laboratory has become moribund through the gradual loss of its staff, owing to the ridiculously small salaries which were paid.

All arrangements have been made by the Board of Railway Commissioners for the patrol of railway rights of way for the protection of the forests from fire for the summer. The plans are well thought out and are based on the experience of past years. It has been found that motor speeder patrol is cheaper than patrol of sections (in the railway sense), but that the latter is more efficient. This is the experience of the C. P. R. Department of National Resources. The St. Maurice Forest Protective Association has not had the same experience.

Mr. James White, of the Commission of Conservation, read a very interesting and able paper before the Rotary Club of Ottawa on the forest resources of the

100,000,000 Feet
National Forest Timber
FOR SALE

Location and amount.—All the merchantable dead timber standing or down and all the live timber marked or designated for cutting on two areas embracing about 10,000 acres on Port Snettisham and Glass Peninsula, Tongass National Forest, Alaska, estimated to be 100,000,000 feet B. M., more or less, of Sitka spruce, western red cedar, Alaska cypress, western hemlock, and other species, approximately 65% western hemlock.

Stumpage Prices.—Lowest rates considered, $1.00 per M for Sitka spruce, western red cedar and Alaska cypress and $ .50 per M. for western hemlock and other species. Rates to be readjusted every five years.

Deposit.—Two thousand dollars must be deposited with each bid to be applied on the purchase price, refunded or retained in part as liquidated damages according to conditions of sale.

Final Date for Bids.—Sealed bids will be received by the District Forester, Portland, Oregon, up to and including June 1, 1920. The time may be extended thirty days upon request from parties having legitimate interest.

The right to reject any and all bids is reserved. Before bids are submitted, full information concerning the character of the timber, conditions of sale, deposits, and the submission of bids should be obtained from the District Forester, Portland, Oregon, or the Forest Supervisor, Ketchikan, Alaska.

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Province of Quebec, with especial reference to the pulp wood supply. He estimates that the supply at the probable rate of consumption which we will have in the future will only last for fifty years.

The Spanish River Pulp and Paper Company will probably have an aviation department soon. They have engaged an aviator and are making their plans.

Price Brothers Company have shipped one Martynside seaplane from England and have ordered another .and should be able to begin work very soon. The Laurentide Company has assembled its planes and will test out in the air in a few days.

Regular flying was begun early in May.

Mr. John D. Gilmour, forester and woods manager for the Anglo-Newfoundland Development Company, is visiting Montreal. He reports a very severe winter with seven feet of snow.

Experiments with wireless telephones are being carried out on a commercial scale in the St. Maurice District but so far have not proved successful. They are being watched with great interest and it is hoped that they will ultimately prove successful. Experiments are also under way between Vancouver and Vancouver Island. When the wireless telephone works properly it is much clearer and more distinct than a land line.

MIGRATORY BIRD LAW UPHELD

THE migratory bird act of 1918, designed to carry out provisions of a treaty between this country and Great Britain for the protection of migratory birds, has been held constitutional by the Supreme Court at Washington.

Justice Holmes, in rendering the majority opinion, declared that "a national interest of very nearly the first magnitude" was involved, and that, except for the treaty and the statute, there soon might be no birds for any power to deal with.

"We see nothing in the Constitution that compels the Government to sit by while a food supply is cut off and the protectors of 'our forests and our crops are destroyed,'" Justice Holmes said.

BOOKS ON FORESTRY

AMERICAN FORESTRY will publish each month, for the benefit of those who wish books on forestry, a list of titles, authors and prices of such books. These may be ordered through the American Forestry Association, Washington, D. C. Prices are by mail or express prepaid.

FOREST VALUATION—Filibert Roth	$1.50
FOREST REGULATION—Filibert Roth	2.00
PRACTICAL TREE REPAIR—By Elbert Peets	2.35
LUMBER MANUFACTURING ACCOUNTS—By Arthur F. Jones	2.10
FOREST VALUATION—By H. H. Chapman	2.50
CHINESE FOREST TREES AND TIMBER SUPPLY—By Norman Shaw	2.50
TREES, SHRUBS, VINES AND HERBACEOUS PERENNIALS—By John Kirkegaard	2.50
TREES AND SHRUBS—By Charles Sprague Sargent—Vols. I and II, 4 Parts to a Volume—Per Part	5.00
THE TRAINING OF A FORESTER—Gifford Pinchot	1.35
LUMBER AND ITS USES—R. S. Kellogg	2.15
THE CARE OF TREES IN LAWN, STREET AND PARK—B. E. Fernow	2.17
NORTH AMERICAN TREES—N. L. Britton	7.30
KEY TO THE TREES—Collins and Preston	1.50
THE FARM WOODLOT—E. G. Cheyney and J. P. Wentling	1.75
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TIMBER, ITS STRENGTH, SEASONING AND GRADING—By H. S. Betts	3.10
THE HISTORIC TREES OF MASSACHUSETTS—By J. R. Simmons	3.65
TIMBERS—AND THEIR USES—By Wrenn Winn	5.15
THE KILN DRYING OF LUMBER—By Harry D. Tiemann	4.65

*** This, of course, is not a complete list, but we shall be glad to add to it any books on forestry or related subjects upon request.—EDITOR.**

THE GUIDE TO NATURE

EDWARD F. BIGELOW, Managing Editor

Published by

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A LUMBERMAN'S SUGGESTIONS

D. F. CLARK, of McOsborne and Clark Lumber Company, of Minneapolis, Minnesota, a member of the American Forestry Association writes:

"I am very much interested in reforestation, and every element that enters into forestry, as I think the time has come when every man, whether he is a lumberman or not, should take a great interest in conserving our forests and woods. I am very much in favor of changing the thicknesses of hardwood lumber, and establishing the custom and practice of using thinner woods in practically every place where inch wood is used.

"The pine men have preserved the forests by establishing the grade on a thinner basis, and the time is here when hardwood should also be established along these lines. Our desks and chairs, floors and everything that does not require strength could be reduced a large percentage, and yet be suitable for the purpose, and it is a great saving to our hardwood. I have advocated this in several places, trying to get the people of Minnesota interested. My experience in selling hardwood to manual training departments is that they insist upon having absolutely clear lumber. They teach the child to make the things, but the child has no conception whatever of the way the wood grows, or the grades which the tree produces. Many of the teachers and children do not know the different kinds of wood, and it would be surprising indeed to learn how few out of 100,000,000, of our countrymen know the kinds of trees, or the kind of wood after the tree is manufactured into lumber.

"I am very much enthused in agitating these matters, as well as matters relating to reforestation and conserving, saving and protecting our forests."

FUTURE TIMBER CROPS

GROWING future timber crops must be largely, though by no means wholly, a Government and State function," said E. T. Allen, Forester, in discussing the leading Forest Policy proposals at the Second American Lumber Congress and 18th Annual Meeting of the National Lumber Manufacturers Association which was held April 20 to 22, at Chicago.

Mr. Allen distinguished between local and national policies and the Congress passed a resolution to the effect that as most forest programs are largely local, local committees of the various regional associations should be appointed to confer with local forest authorities to determine the steps needful and to promote their adoption. An early declaration of principles in the light of what shall be determined is urged so that a wise and efficient policy may be developed looking to the perpetuation of forest supplies.

Dr. Hugh P. Baker, Secretary of the American Paper and Pulp Association, presented the forest policy promulgated by his association in a splendid talk.

BOWS OF YEW FOR MODERN ARCHERS

IT is a far cry from long-range rifles and high-powered explosives to the bow and arrow of the American Indian. Nevertheless, bows and arrows are still used by the small boy, albeit not without sorrow to the neighbor's chickens. There is also a demand for stronger and more expensive bows for archers of mature years. Doubtless these facts account for a recent sale, on the Snoqualmie National Forest in Washington, of a quantity of yew, to be used in making bows. Although the Forest Service of the United States Department of Agriculture sells a variety of forest products for unusual uses, this is probably the first case in which the final product is to be one of the oldest and most common weapons known to the world.

The yew has long been known as the best of all bow woods. Famous English archers would have no other. Richard III ordered bowyers to make four bows of witch-hazel, ash, or elm to every one of yew, in order that the supply of this valued wood might be preserved. This is said to be one of the earliest forest regulations in England. The staves from which bows were made in those early days were seasoned for three years before being made into bows and the bows were not used for two years after being completed.

The American yew is botanically very similar to the European yew. One of the three species in the United States grows only in Florida and is a small tree. Another is a shrub growing in the north Atlantic region, while the third occurs in the forests of the Pacific coast. It is the latter that grows in the Snoqualmie National Forest. When mature it usually is from 20 to 30 feet high and from 6 to 12 inches in diameter.

On account of its elasticity and strength the Indians of the Northwest utilized the wood of the yew for their bows and often for canoe paddles. Yew wood is also well adapted to carving and numerous attractive articles can be made from it. Not only does the grain of the wood make it possible to carve attractive designs, but the combination of red bark, white sapwood, and rose-red heartwood make especially pleasing effects possible.

FARMERS SHOULD OBSERVE "WOODLOT DAY"

A "WOODLOT DAY" should be established for general observance by Pennsylvania farmers. It could be a day in the spring as soon as conditions permit, when small trees can be planted in the woodlot, or tree seeds sown, according to Professor J. A. Ferguson, of the Forestry Department at the Pennsylvania State College.

"Just as Arbor Days are observed by the towns people, so should the farmers have a Woodlot Day, by official proclamation, if necessary," he says. From the forestry standpoint, a farmer is a man who year after year cuts trees out of the woodlot and never plants any to take their places. The process can have but one ending, the gradual thinning out of trees and the final loss of one of the most valuable farm assets. For every tree that is cut out, a dozen small trees should be planted.

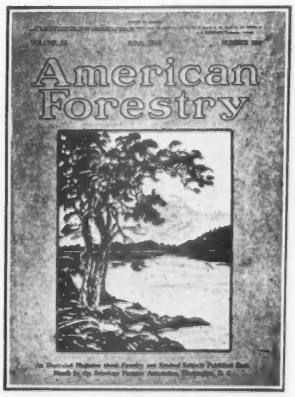
A hundred little one-year-old hardwood trees will not cost much to purchase. They can often be dug up under trees growing in the open, or thinned out from spots where they are growing too thickly. They can often be obtained free of charge from the Pennsylvania State Forestry Department at Harrisburg. A hundred or more of these trees planted each year on "Woodlot Day" will keep the woodlot well stocked and insure the future supply of a rapidly decreasing commodity. They are the children of the woodlot and there can be no future without them.

Under the trees in the spring of the year will be found many seeds that have been stratified naturally under the snow. They can be gathered and planted at once. Many need no more attention than placement in a hole made with a small stick with the earth firmed over with the foot. For small seeds a seed spot should be made, the grass and weeds stripped off for a foot and the seeds planted as any garden seed. Establish a "Woodlot Day" on the farm.

BECOME A MEMBER

Any person may become a member of the American Forestry Association upon application and payment of dues.

PLANT TREES
PROTECT FORESTS
USE FORESTS



This is the only Popular National Magazine devoted to trees and forests and the use of wood.

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SALE OF TIMBER
MESCALERO INDIAN RESERVATION
NOGAL UNIT

SEALED bids in duplicate, marked outside "Bid Nogal Timber Unit" and addressed to Superintendent Mescalero Indian School, Mescalero, New Mexico, will be received until twelve o'clock noon, Mountain Time, Tuesday, July 20, 1920, for the purchase of timber on a tract comprising the Nogal drainage area on the southwestern portion of the Mescalero Indian Reservation and situated within Townships 13 and 14 South, Range 12 E., New Mexico Meridian. The said unit comprises about 9,000 acres with an estimated stand of over 50,000,000 feet, chiefly Douglas fir and western yellow pine. Each bid must state the price per thousand feet, Scribner Decimal scale, that will be paid for timber cut and scaled prior to April, 1925. Prices subsequent to that date are to be fixed by the Commissioner of Indian Affairs, by three-year periods. No bid of less than three dollars ($3.00) per M. feet for yellow pine and Douglas fir, two dollars ($2.00) per M. for Mexican white pine and Engelmann spruce and one dollar ($1 00) per M. for white fir during the period ending March 31, 1925, will be considered. Each bid must be accompanied by a certified check on a solvent national bank, payable to the said Superintendent in the amount of six thousand dollars ($6,000). The deposit will be returned if a bid is rejected, but retained as liquidated damages, if the required contract and bond for $15,000,000 are not executed and presented for approval within sixty days from the acceptance of a bid. The right to reject any and all bids is reserved. Copies of the bid and contract forms and other information may be obtained from the Superintendent, Indian School, Mescalero, New Mexico.

Washington, D. C., May 10, 1920.

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Commissioner.

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Near Belfast, Maine

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House contains bath, town water, electric light and furnace. Nearly five acres of land and a big barn-garage, with sleeping quarters. A small amount will put whole place in A-1 condition. Offered for quick sale—a bargain at $20,000.

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STATE NEWS

MASSACHUSETTS

THE Committee on Agriculture, of Massachusetts, in executive session recently voted to report a bill to permit the county commissioners to raise such sums as they may judge expedient in their several counties for the purpose of giving aid to their county farm bureaus.

The committee also voted to report the bill on the initiative petition that the State Forest Commission be authorized to buy 20,000 acres in the State for the purpose of producing timber and protecting the water supply. There goes with this, as a part of the subject, a favorable report on the petition of George H. Graham, former member of the old board of fisheries and game, for authorization of the State Forest Commission to buy 250,000 acres. The Graham bill has five sections, three of which are reported. It provides for the purchase within 10 years, at not more than the present authorized price, or such price as the Legislature may fix, the State Commission to be authorized to open the whole or any portion of the lands to public fishing and shooting.

NEW JERSEY

A SURVEY of the progress of forestry in New Jersey, conducted by the State Forester during the past winter to determine the extent that woodland owners have actively engaged in forestry practice, has shown most gratifying results. Since the State of New Jersey owns less than one per cent of the forests within her borders, it has been the policy of the State Forester to support and encourage the interest of private owners in the practice of forestry, and in this way serve the public interest. Many owners who have taken advantage of this aid, have found forest planting and woodland management both practicable and profitable.

The replies received to questionnaires sent to all persons who have indicated an interest in forestry in the past, show that 114 active co-operators, including 11 municipalities and public institutions, have practiced intensive forestry methods, including fire protection, improvement cutting, close utilization of products, etc.—on approximately 10,000 acres of woodland, while 40,000 acres more under the same ownership have been protected and improved to some extent, and definite plans have been made for more intensive management. The same co-operators, together with 41 others who are at present inactive, are planning to extend forestry management to more than 12,000 acres of woodland that have received no attention up to this time.

Progress has also been made in forest planting. While natural reproduction is usually adequate and satisfactory in many parts of the State, it is often necessary to re-establish forest growth by planting on land unwisely cleared and unfit for agriculture, or where all reproduction has been destroyed by fire. More than 1600 acres have been reproduced by persons co-operating with the State Forester, and nearly 300 acres more will be planted within a short time.

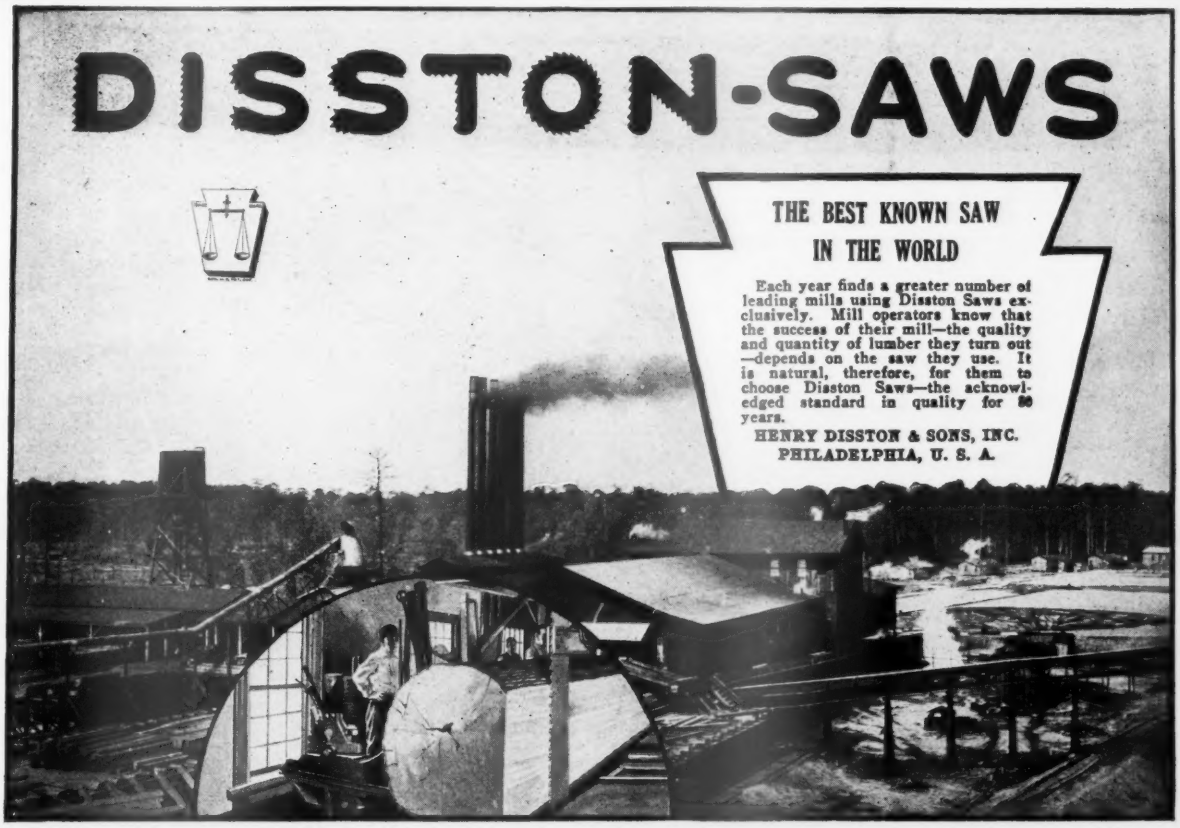
Believing that number of State Forests are valuable as a public demonstration of the methods and results of forestry practice, the State has acquired six State Forests with a total area of 16,591 acres of woodland, managed by the State Forester. Upon these lands 50 acres of forest plantations have been made, for the purpose of experiment and demonstration.

Altogether there are 80,000 acres within the State, approximately 4 per cent of the State's total woodland area, upon which forestry practice is now established or definitely planned for in the immediate future. The owners have been won over to the realization of the importance and practicability of forestry methods and are pledged to its practice.

The progress indicated in this survey is encouraging when it is realized that this work was commenced less than 15 years ago, but the accomplishment seems insignificant when we consider what yet remains to be done. New Jersey has nearly 2,000,000 acres of woodland, most of which is in a run-down condition because of repeated forest fires, wasteful logging, neglect of owners and abuse by the public. Nearly three-quarters of this area is unfit for any profitable use other than growing timber. New Jersey's problem is to return this vast area of semi-waste land to productiveness, and this can be done only by preventing and controlling forest fires and by applying practicable forestry management to the woodlands. When protection and management become established, the value of New Jersey's woodlands will be increased from less than $6,000,000 to over $200,000,000. Instead of furnishing less than one-tenth of the lumber used within the State, as at present, New Jersey's woodlands are capable of supplying a very great portion of the lumber and wood consumed within her borders. It is needless to point out the benefits to land owners, producers and consumers that will result.

Plant Memorial Trees

DISSTON-SAWS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Each year finds a greater number of leading mills using Disston Saws exclusively. Mill operators know that the success of their mill—the quality and quantity of lumber they turn out—depends on the saw they use. It is natural, therefore, for them to choose Disston Saws—the acknowledged standard in quality for 80 years.
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Our DEPARTMENT OF SAFETY-FIRST, under the supervision of a capable and experienced engineer, is very actively engaged in work tending to reduce and eliminate injuries to workers in Southern sawmills and woods.

SOUTHERN PINE SERVICE ASSOCIATION

SOUTHERN PINE ASSOCIATION
NEW ORLEANS, LA.

National Forest Timber For Sale

The Forest Service invites investigation of an opportunity for securing raw material for a tannic acid plant on or near the Nantahala National Forest, North Carolina. The estimated volume of chestnut acidwood, which will be advertised for sale on application from a responsible prospective bidder, is approximately 150,000 cords, on the National Forest. There is an additional amount of approximately 200,000 cords on adjacent private land. The total is sufficient to supply an extract plant of efficient size for 25 years. Favorable topography will facilitate logging. For detailed information in regard to this opportunity, including the terms under which the National Forest stumpage will be advertised for sale to the highest bidder, application should be made to the

Forest Supervisor

Franklin, North Carolina

INDIAN FORESTER HERE

MR. CHARLES GILBERT ROGERS, F. C. H., F. L. S., C. I. E., who has been in the Imperial Indian Forest Service for thirty-two years, including seven years as Professor at the Dehra Dun Forest School and seven years as Chief Conservator in the Forests of Burma, is now spending from twelve to fifteen months in this country, with a party of sixteen English Engineers, preparatory to their work in India. Their work will consist largely of practical training in logging and sawmill work and about wood-working operations. All of these men have been trained as mechanical or civil engineers in England and all have been through the great World's War, mostly in the Royal Engineers. They have recently been appointed Forest Engineers to the Imperial Government of India, to form a nucleus of a Forest Engineering Branch of the Indian Service, and immediately after arrival in New York, about the middle of April, they went to several large skidder and cableway logging operations in the Southern Appalachian Mountains. A Forest Officer of Nigeria has joined the party to study logging conditions with a view to introducing American logging methods in Africa.

Mr. Rogers was the first graduate of the first English Forest School, established at Coopers Hill, England. This was in 1887. He was retired from the Imperial Indian Forest Service in February 1920, but was persuaded to take up this work especially for the Indian Service, on account of his thorough knowledge of conditions in India, as well as his familiarity with American conditions, having spent sometime in this country in 1906, going through the principal forest districts of this country and studying the methods of both private and national forestry.

Mr. Rogers and his party of students plan to spend sometime on the most important logging operations in the Southern Appalachian hardwood forests; the Southern pineries; the Lake States; the Inland Empire; the Douglas fir belt and the redwood and California pine sections. They will also visit several of the Forest Schools and the Madison Laboratory.

TIMBER HELPS POOR LANDS

TIMBER is essentially a poor land crop. Steep slopes, poor soil, rocky land, unusual corners, gullied and wooded tracts—all these afford opportunities for growing timber profitably, say specialists of the Forest Service, United States Department of Agriculture. A careful survey of the average farm will reveal a surprising number of spots of this sort which can be utilized to advantage. If they do not already have trees, planting them with the proper varieties will materially increase the value of the land.

SOIL-BUILDING POWER OF TREES

Certain kinds of trees, like the locust and the acacias, build up poor soil through the nitrogen-gathering bacteria in the root nodules, according to the Forest Service, United States Department of Agriculture. The soil-building power of trees on slopes is a fact which the farmer should not overlook. Steep lands, which have been cleared of timber at much expense, after being cultivated for a few years, often become gullied, and the rich lands adjoining are covered with deep deposits of sand. The surest and cheapest method of protecting such slopes is to maintain forests on them.

Small gullies can be stopped up by closely packed brush and tree tops, anchored by stakes if necessary. Large, open gullies are checked successfully only by planting over the entire gully basin, supplemented by low brush dams across the larger units of the gully.

EMPIRE STATE FOREST PRODUCTS ASSOCIATION

PROFESSOR A. B. RECKNAGEL, Secretary of the Empire State Forest Products Association, in an address on Forest Products Day at the New York State College of Forestry, said: "The object of any associated activity is the opportunity to do collectively what every member seeks to do individually. Thus the Empire State Forest Products Association seeks to protect, perpetuate, and increase the forest growth of the State. Its appeal to the forest industries is that they place themselves honestly and squarely on a broad, public-spirited, comprehensive policy which will result in the conservative use of one of the Nation's fundamental resources, the forest, and continued prosperity for the wood-using industries and hence consumers of New York State.

"Members of this Association control nearly a million and a half acres of forest land in the Adirondacks. They manufacture yearly more than a hundred million board feet of lumber, and over half a million tons of paper. Such a membership must adopt a rational, conservative forest policy, which will result in the perpetuity of their forest industries through wise use.

"The Association is actively concerned in the framing and passing of fair forest taxation measures, co-operative fire protection, the development of water power, and the formulation of a permanent timber policy for the State and Nation. The New York State College of Forestry co-operates very effectively with the Association in these matters, since its policy is to promote the fullest use of the forest resources consistent with their protection and development. The people of New York State will one day realize the sound economic basis of the Association's slogan of 'Protect, Increase, and Restore.'"

LUMBERMEN CONSERVING LUMBER

"LUMBERMEN generally are daily performing wonders in the way of conserving the present supply to its proper use, by striving to educate all users of lumber to purchase and use the particular grade adapted to their particular purpose. The lumberman, such as our company, which is using for the so-called novelties, only that lumber which is not suited to use in more expensive lines of manufacture, is a true conservationist."

This was the viewpoint of W. C. Hull, president of the Oval Wood Dish Company, of Tupper Lake, in an address on Forest Products Day of the Forest Week of the New York State College of Forestry at Syracuse.

"The most flagrant and openly apparent waste that has come under my observation in recent years is now being committed by the State of New York in permitting its valuable hardwood trees, particularly the beautiful birch, to wither away and die of old age, without having performed their duty to humanity. They are dying literally by thousands, and instead of serving any useful purpose, they become a menace to the balance of the timber. The price of one birch tree removed and converted into useful commodities would suffice to replant one thousand seedlings on some barren lands belonging to the State. Shall prejudice of city dwellers who make the forests their playground, and their refusal to post themselves as to the true situation forever cause this waste to continue?"

In discussing the use of wood for novelties, Mr. Hull said that the annual consumption of wooden dishes is about one billion, and of paper dishes, made from wood products is about two billion. The wooden dish industry uses from seventeen to twenty million feet of lumber a year. He said there has been no improvement in the making of clothes pins for forty years. The annual consumption is nearly 2,000,000, boxes, requiring 20,000,000 feet of lumber.

PROTECTING WOODLANDS FROM INJURY

THAT young growth in the woods, known popularly as "brush," is something to be rid of, is a prevalent but mistaken conception, since, as forestry specialists of the United States Department of Agriculture point out, a forest can not maintain itself long without reproduction. For the sake of getting a scattering of green grass in the spring, it is the short-sighted practice in hundreds of localities to fire the woods regularly. This results in killing thousands of small trees needed to continue the forest in the future and also injures a large amount of marketable timber. Furthermore, such burning destroys a large amount of rich vegetable fertilizer.

Cattle and hogs in hardwood stands and hogs in long-leaf pines keep the forest from being restocked. Damage from insects can be reduced by cutting timber at the proper time of year and by utilizing lightning-killed trees without delay, since they harbor destructive pests. Cattle destroy the productive leaf mulch which keeps the trees growing during long, dry spells. All large openings where light comes through into the forest should be filled with younger trees. Fully stocked woods contain little or no grass, but afford full shade, which prevents the soil drying out and keeps the trees growing.

DYNAMITE—THE SOIL REJUVENATOR

"A LANDSCAPE engineer has a great many queer problems presented to him by the owners of country estates," says Norman Suplee. "One put up to me a short time ago would have stumped me completely had I not been familiar with the use of dynamite.

"There were about five acres of land in the tract. In order to save the time that it would have taken to mow the grass, it had been burned off for a good many years, the result being that the humus in the topsoil had been almost completely destroyed. The drainage on the tract was also poor and the soil had become sour. The grass grew all over it in big clumps such as may be seen in swamp land. The new owner wanted a smooth lawn. I saw at once that the drainage would have to be corrected and that a way must be found to supply new plantfood for the sustenance of the surface growth.

"I first went over the entire tract and put down 1½-inch bore holes 18 inches deep and about 9 or 10 feet apart. A third of a stick of dynamite was tamped into each hole and fired. Then around the trees, bore holes were put down to a depth of 3 or 4 feet and about 10 feet apart out at the edge of the foliage line and similar charges exploded in these. I then blasted a number of small ditches which emptied into the little stream flowing at the base of the property.

"A year later an examination of the tract showed that no more deadwood had developed on the trees. The grass had ceased to grow in clumps, had lost its yellowish cast and had become a smooth deep green. Many of the old trees had put on as much as eight inches of new growth at the end of the branches and some old grapevines which had been injured by the burning of the grass yielded a crop for the first time in many years. The vegetable garden which had refused to grow anything previously, after being aerated by the blasting, had netted the owner $200 profit. The garden consisted of an acre and a half of ground. If landscape engineers would study the problem, they would find many ways of using dynamite to great advantage."

FORESTERS ATTENTION

AMERICAN FORESTRY will gladly print free of charge in this column advertisements of foresters, lumbermen and woodsmen, discharged or about to be discharged from military service, who want positions, or of persons having employment to offer such foresters, lumbermen or woodsmen.

POSITION wanted by technically trained Forester. Have had fourteen years experience along forestry lines, over five years on the National Forests in timber sale, silvicultural and administrative work; three years experience in city forestry, tree surgery and landscape work. Forester for the North Shore Park District of Chicago. City forestry and landscape work preferred, but will be glad to consider other lines. Can furnish the best of reference. Address Box 600, Care American Forestry Magazine, Washington, D. C.

YOUNG MAN recently discharged from the U. S. Navy, wants employment with wholesale lumber manufacturer; college graduate; five year's experience in nursery business; can furnish best of references. Address Box 675, Care American Forestry Magazine, Washington, D. C.

RECENTLY discharged from U. S. Army, young man wants position with a firm who has use for a lumber tallyman and inspector. Has a good education, 11 years' practical experience in lumber and can furnish good references. Address Box 880, care of American Forestry Magazine, Washington, D. C.

ARBORICULTURIST is open to an engagement to take charge of, or as assistant in City Forestry work. Experience and training, ten years, covering the entire arboricultural field—from planting to expert tree surgery—including nursery practice, and supervision in the care and detailed management of city shade trees. For further information, address Box 700, care of American Forestry.

WANTED—Position as Forester and Land Agent. Technically trained forester, 35 years old. Practical experience along all lines included under the duties of the above positions. Former Captain, Field Artillery. Address Box 840, care American Forestry, Washington, D. C.

WANTED—Position with Lumber Company or Private Concern by technically trained Forester with five years practical experience. Box 820, care American Forestry.

A FORESTRY graduate with several years experience in forest work and at present employed along technical and administrative lines desires responsible position with private concern operating in and outside the United States. Address Box 870, care of American Forestry Magazine, Washington, D. C.

DISCHARGED SAILOR would like position as assistant forester or a permanent position as surveyor with some lumber company with a chance for advancement. Salary is of secondary consideration. Married, so would have to locate in some small town. Have had four years' practical experience in general forestry, and some tree surgery. Address Box 900, care of AMERICAN FORESTRY MAGAZINE, Washington, D. C.

POSITIONS OPEN

MAN WANTED with technical training and practical experience sufficient to make him thoroughly competent as a developer of Park plans, and also Park Superintendent—both in road construction, planting and landscape work—and Director of Forestry Service upon the public streets and parks of the city. Address Box 910, American Forestry Magazine, Washington, D. C. (6-9-20)

WANTED—Man capable of Supervising Slack and Tight Barrel Plant; Purchase and Inspect Cooperage Stocks; Develop Boxes, Crates and other Packages for miscellaneous articles. State experience, salary wanted and references in first letter. Address Box 123, care of AMERICAN FORESTRY MAGAZINE, Washington, D. C.

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Correspondence Course in Lumber and Its Uses. No tuition, and otherwise expenses are the lowest.

For Further Particulars Address

Dean, School of Forestry
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Forestry Training
in the Heart of the Rockies

***The* Colorado School *of* Forestry**

A Department of Colorado College
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Professional Courses in Technical Forestry, leading to degrees of Bachelor of Science in Forestry and Master of Forestry.

Spring and Fall Forestry teaching at Manitou Forest (a 7,000-acre forest belonging to the College) and the winter term at Colorado Springs.

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You can produce sales or inquiries with personal letters. Many concerns all over U. S. are profitably using Sales Letters we write. Send for *free* instructive booklet, "*Value of Sales Letters.*"

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FOREST SCHOOL NOTES

UNIVERSITY OF WASHINGTON COLLEGE OF FORESTRY AND LUMBERING

PREPARATION for the All-Engineers and Foresters "Open House," held April 22-24, has occupied the attention of the Forest Club, during the past quarter. The work of the Forest School and a graphic portrayal of the fields of logging and lumbering, forest products, and forestry was presented to the 18,000 visitors who attended the "Open House." A model forest under management with growing trees from the Forest Nursery representing the different age classes and miniature steam logging operations and sawmill in actual operation attracted considerable attention. A model paper and pulp mill was also being constructed. Forest products, wood preservation, timber testing, dendrology and wood technology exhibits were displayed. The "Open House" was abandoned during the period of the war, but the Foresters won the prize for the best exhibition at the last three held, and are making a diligent effort to repeat their success this year.

The Forest Club has had the opportunity of hearing some exceptional talks by a number of prominent authorities. At the meeting of February 17, Mr. R. L. Fromme, District Forest Inspector of Recreation and Game, told of the project of introducing Alaskan moose and mountain goats into the Olympic National Forest. Mr. Shirl Blalock, district office manager of the United States Bureau of Foreign and Domestic Commerce, spoke on lumber exporting, the evening of February 24. Mr. William M. Hall, of Hall-Kellogg, Chicago, who has an international reputation as a forester, spoke on the proposed forest land policy and its importance to the states of the Pacific Northwest.

Mr. S. W. Barker, premier motor truck logging authority on the Pacific Coast, gave a highly entertaining and instructive talk on motor truck logging. Motion pictures of Mr. Barker's operations near Lake Whatcom gave added interest to the address. Road construction, unloading, care of trucks, capital required and financing were discussed in detail.

Sufficient funds were raised in the College of Forestry and Lumbering itself to send R. M. Smith as a delegate to the Intercollegiate Association of Forest Clubs convention at New Haven. Mr. Smith carried proxy votes from the Forest Clubs at the University of Idaho, Montana and Minnesota.

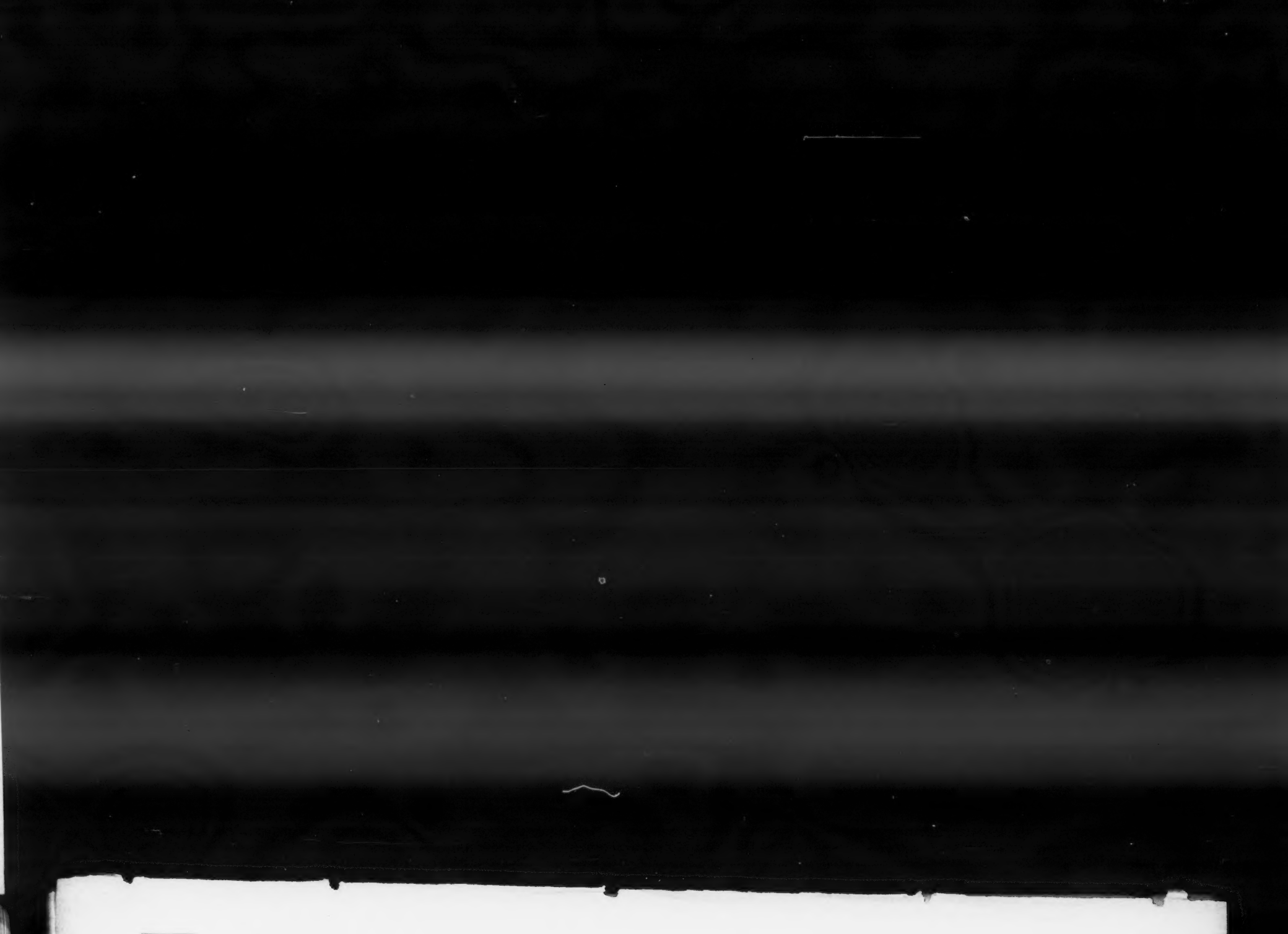
The Short Course at the College of Forestry and Lumbering, held during the winter quarter, was attended by 22 men, most of them having considerable experience already in the lumbering industry and the Forest Service. Five Canadians were registered for the Short Course.

An 8-reel motion picture show given at one of the regular Forest Club meetings attracted wide-spread attention on the campus and many students from other departments were present. Accident prevention in logging camps and sawmills was the subject of the film, which was taken for the California Accident Insurance Commission. A film showing the manufacture of matches was also shown.

A number of responsible logging engineering positions have recently been taken by graduates of the school. George O'Brien, '18, has accepted the position of logging engineer with the Capilano Timber Company, at North Vancouver, British Columbia. J. W. Ottestad, '12, formerly with the C. O. Mengel Company, Axim, Gold Coast, South Africa, is now engineer for the Three Lakes Lumber Company, Three Lakes, Washington. Harry M. Lind, '19, is assistant engineer with the George Palmer Lumber Company, Vincent, Oregon. Ervin Rengstorff, '15, is logging engineer for the same company. Joseph G. G. Morgan, '13, has accepted a position as superintendent of construction for the K. & M. Logging Company, Independence, Washington. This camp was formerly operated by Wilson Brothers, of Aberdeen.

George Hutton, '15, has established a veneer mill at Olympia, Washington, to specialize in the production of veneers from alder, black cottonwood, hemlock, spruce and fir.

YALE FOREST SCHOOL

THERE never was a period since the organization of the School of Forestry at Yale when so many inquiries have been received from timberland owners and corporations regarding trained foresters. It has been our custom to secure summer positions for men who are in the progress of their professional training. This year for the first time not more than one-tenth of the positions available for summer work and at higher wages than ever before, can be filled. There are also a large number of inquiries for foresters completing their professional training and good positions are available for every man who wants to enter private work after the completion of his training.

The summer camp of the Yale School of Forestry will open at Milford, July 1, and will be in charge of Professor R. C. Hawley. Arrangements are made to enter students for the regular two year technical course, leading to the degree of Master of Forestry, and for a certain number of special students and for research students.